THE AFRICAN REPUBLIC OF LIBERIA

AND THE BELGIAN CONGO

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AND THE BELGIAN CONGO

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CONTRIBUTIONS FROM THE DEPARTMENT OF TROPICAL MEDICINE AND THE
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THE AFRICAN REPUBLIC OF LIBERIA
AND THE BELGIAN CONGO

Based On The Observations Made and Material Collected During The

HARVARD AFRICAN EXPEDITION
1926-1927

EDITED BY RICHARD P. STRONG

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IN TWO VOLUMES
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TABLE OF CONTENTS

VOLUME II

Part III (*Continued*)

MEDICAL AND BIOLOGICAL INVESTIGATIONS

XXXIII. MAMMALS 569

MAMMALS OF LIBERIA 569
By Glover M. Allen and Harold J. Coolidge, Jr.

NOTES ON THE GORILLA 623
By Harold J. Coolidge, Jr.

XXXIV. BIRDS 636

THE BIRDS OF LIBERIA 636
By Glover M. Allen

BIRDS COLLECTED IN THE BELGIAN CONGO 749
By Herbert Friedmann

XXXV. HERPETOLOGY 769

REPTILES AND AMPHIBIANS FROM LIBERIA 769
By T. Barbour and A. Loveridge

REPTILES AND AMPHIBIANS FROM THE CENTRAL AFRICAN LAKE REGION 786
By T. Barbour and A. Loveridge

XXXVI. ENTOMOLOGY 797

MEDICAL AND ECONOMIC ENTOMOLOGY 797
By J. Bequaert

Arachnoidea 798
- Linguatulida 798
- Ricinulei 798
- Acarina 799

Insecta 819
- Isoptera 819
- Heteroptera 823
- Dermaptera 824
- Orthoptera 824
- Diptera 825
- Anoplura 994

Mallophaga 997
Siphonaptera 999
Coleoptera 1001

ANEUROBRACON, A REMARKABLE NEW GENUS OF BRACONIDAE FROM LIBERIA 1002
By Charles T. Brues

THE CRANE-FLIES (Family Tipulidae, Order Diptera) 1004
By Charles P. Alexander

REPORT UPON CERTAIN ECTOPARASITES OF MAMMALS 1022
By G. F. Ferris
Hemiptera 1022
Mallophaga 1023
Anoplura 1038

ODONATA COLLECTED IN LIBERIA AND THE BELGIAN CONGO 1039
By Philip P. Calvert

NEUROPTEROUS INSECTS 1045
By Nathan Banks

XXXVII. PHOTOGRAPHY 1048
By Loring Whitman

INDEX 1053

LIST OF ILLUSTRATIONS

VOLUME II

MAP PAGE

VIII. Map illustrating distribution of coast and mountain gorillas 633
IX. Map showing the present known distribution of *Ornithodoros moubata* (Murray). The interrupted line marks the extent of the West African and Congo rain forest 813

ILLUSTRATION

444. Skin of *Felis pardus reichenowi* Cabrera, Liberia 585
445. *Colobus badius* (*ferrugineus*) 585
446. Zoological tray, rodents, Gbanga, Liberia 603
447–449. Long-tailed Manis, *Uromanis longicaudatus* (Brisson) 603, 605
450. Pygmy antelope, *Neotragus pygmaeus* (Linné) 611
451. *Tragelaphus scriptus scriptus* 611
452. Right ear of elephant from behind. Liberia 617
453. Elephant jaws, Trué Town, Liberia 617
454. Mountain gorilla, west of Lake Kivu, Belgian Congo 626, 627
  (*a*) as it appears in the Museum of Comparative Zoology 626
  (*b*) showing relative size 627
455. Mountain trail into gorilla country, altitude 8,500 feet 627
456. Trail into gorilla country, pygmies in foreground 627
457. Mountain forest in gorilla country 627
458–461. Pygmies in gorilla country, west of Lake Kivu 631
462. Crocodile, *Crocodylus cataphractus* Cuvier 771
463. *Dendraspis viridis* (Hallowell), 7 ft. 5 in. in length 771
464. *Chamaeleon gracilis* Hallowell 771
465. (FIGS. 1–4.) (Colored Plate.) New Ranoid Frogs from Liberia. Nos. 1, 2, 4, twice natural size; No. 3, three times natural size . . . . *opposite* 778
  FIG. 1. *Cardioglossa decorata* sp. n. Type. (MCZ No. 12032) . . “ “
  FIG. 2. *Cardioglossa liberiensis* sp. n. Type. (MCZ No. 12034) . . “ “
  FIG. 3. *Rana alleni* sp. n. Type. (MCZ No. 11991) . . . . . . “ “
  FIG. 4. *Phrynobatrachus liberiensis* sp. n. Type (MCZ No. 11993) “ “
466. (FIGS. 1–6.) (Colored Plate.) Liberian Tree Frogs of the genus *Hyperolius*, 2 x natural size . . . . *opposite* 782
  FIG. 1. *H. ocellatus* Günther (MCZ No. 12009) . . . . *opposite* 782
  FIG. 2. *H. concolor* (Hallowell) (MCZ No. 12021) . . . . “ “
  FIG. 3. *H. ocellatus* Günther (MCZ No. 12006) . . . . “ “
  FIG. 4. *H. pleurotaenia* (Boulenger) (MCZ No. 12015) . . . . . “ “
  FIG. 5. *H. puncticulatus* (Pfeffer) (MCZ No. 12016) . . . . . . “ “
  FIG. 6. *H. festivus* sp. n. Type. (MCZ No. 12018) . . . . . . “ “
467. Termitarium of *Macrotermes natalensis*, at Camp No. 3, Du River, Liberia. Outside view after clearing the plant growth 820
468. The same opened 820
469. Mushroom gardens in the termitarium of *Macrotermes natalensis*, Du River, Liberia 821

470. Breeding place of *Anopheles* near the cemetery of Monrovia, Liberia . . . 821
471. Grove of bamboos at Camp No. 3, Du River, Liberia. Breeding place of *Eretmapodites chrysogaster* and *Megarhinus* 830
472. Breeding place of *Aëdes aegypti* and *A. apicoargenteus* (see arrow), at Camp No. 3, Du River, Liberia 832
473. Breeding place of *Aëdes aegypti* and *A. apicoargenteus* at Camp No. 3, Du River, Liberia 832
474. Breeding place of *Aëdes fuscinervis*, *Culex consimilis*, and *Anopheles gambiae*, in a forest clearing at Camp No. 3, Du River, Liberia 835
475, 476. Breeding place of *Simulium* sp. at Gbanga, Liberia 855

TEXT FIGURES

VOLUME II

FIGURE PAGE
3. Schematized longitudinal section of termitarium of *Macrotermes natalensis* (Haviland). The numbers refer to the five zones described in the text 822
4. *Eusimulium damnosum* (Theobald). Female 853
5. Larva of *Simulium*, species, at Gbanga, Liberia 856
6. Dorsal and ventral aspects of pupa and cocoon of *Simulium*, species, at Gbanga, Liberia 857
7. Head and antenna in profile of *Chrysops neavei* Austen, female 896
8. Markings of the eyes of African *Chrysops* in life; *a*, *C. brucei* Austen, female; *b*, *C. brucei*, male; *c*, *C. longicornis* Macquart, female; *d*, *C. longicornis*, male; *e*, *C. funebris* Austen, female. The bright green areas are marked in black, the dark purplish areas in white 896
9. *Aneurobracon bequaerti*, new species. *a*, hind leg; *b*, abdomen in profile; *c*, wings. All parts drawn at the same magnification 1003
10. (1) *Limonia (Limonia) firestonei*, sp. n.; wing 1009
  (2) *Limonia (Limonia) bequaerti*, sp. n.; wing . . . . "
  (3) *Protorimarga bequaertiana*, gen. et sp. n.; wing . . . . "
  (4) *Helius cacoxena* (Alexander); wing . . . . "
  (5) *Eriocera monroviæ*, sp. n.; wing . . . . "
  (6) *Podoneura bequaertiana*, sp. n.; wing . . . . "
  (7) *Podoneura anthracogramma* Bergroth; wing . . . . "
  (8) *Podoneura brevifurcata* Alexander; wing . . . . "
  (9) *Teucholabis nodipes praescutellaris*, subsp. n.; wing . . . . "
  (10) *Teucholabis rubrithorax* Alexander; wing . . . . "
  (11) *Limonia (Limonia) firestonei*, sp. n.; male hypopygium . . . . "
  (12) *Protorimarga bequaertiana*, gen. et sp. n.; male hypopygium . . . . . "
  (13) *Styringomyia liberiensis*, sp. n.; male hypopygium . . . . "
  (14) *Styringomyia dendroides*, sp. n. male hypopygium . . . . "
11. Venational symbols: Cu = Cubitus; M = Media; R = Radius; Sc = Subcosta
  (1) Venation of *Protorimarga bequaertiana*, gen. et sp. n. 1010
  (2) Venation of *Orimarga*, sp. 1010
12. *Eoctenes nycteridis* (Horváth): *A*, male; *B*, tarsus of middle leg; *C*, general appearance of genitalia; *D*, antenna; *E*, spiracle 1023

13. *Eurytrichodectes paradoxus* Stobbe, female 1027
14. *Trichodectes serraticus* Hill, male and female 1028
15. *Trichodectes serraticus* Hill: *A*, genitalia of male; *B*, outline of anterior margin of head of male; *C*, outline of posterior lobe of head; *D*, gonapod and portion of vulvar region of female 1029
16. *Trichodectes granulatus*, n. sp.: *A*, female; *B*, outline of posterior lobe of head; *C*, markings of intersegmental membrane; *D*, gonapod and portion of vulvar region 1029
17. *Trichodectes univirgatus* Neumann, male and female 1030
18. *Trichodectes univirgatus* Neumann: *A*, genitalia of male; *B*, gonapod of female; *C*, outlines of posterior lobe of head of male and female; *D*, internal sac associated with the uterus 1030
19. *Trichodectes lindfieldi* Hill, male and female 1032
20. *Trichodectes lindfieldi* Hill: *A*, genitalia of male; *C*, outline of posterior lobe of head; *D*, apex of antenna of male; *E*, apex of antenna of female; *G*, internal sac associated with uterus; *H*, gonapod. *Trichodectes dendrohyracis* n. sp.: *B*, genitalia of male; *F*, internal sac associated with the uterus 1033
21. *Trichodectes sternatus* Bedford, male and female 1035
22. *Trichodectes sternatus* Bedford: *A*, genitalia of male; *B*, gonapod; *C*, apex of antenna of male; *D*, apex of antenna of female 1035
23. *Trichodectes congoensis* n. sp., male and female 1036
24. *Trichodectes congoensis* n. sp.: *B*, gonapod; *D*, detail of genitalia of male; *E*, genitalia of male. *Trichodectes baculatus* n. sp.: *A*, genitalia of male (only part of basal plate shown); *C*, detail of genitalia of male 1037
25. Vulvar lamina of *Orthetrum microstigma* (Ris): *a*, ventral view; *b*, oblique view, ventrally 1040
26. *Acisoma panorpoides ascalaphoides* (Rambur), female, Monrovia, Liberia. Malformed left hind wing 1042
27. *Palpares manicatus* var. *connexus* Banks. Male, holotype 1045
28. Male genitalia in profile of *Palpares manicatus* (Rambur) (*a*) and *P. tigris* (Dalman) (*b*), showing difference in the shape of the process between the superior appendages and the ventral plate 1046

XXXIII

MAMMALS OF LIBERIA

By Glover M. Allen and Harold J. Coolidge, Jr.

The mammalian fauna of Liberia was practically unknown until Büttikofer and his associates, Sala and Stampfli, undertook its investigation in the years 1879–1882, and again in 1886–1887. Although they did not at any time go very far from the coast, the forest cover of the country is so nearly homogeneous that they were able to investigate the fauna of the coastal part sufficiently to give a very excellent idea of its mammalian life as a whole. On the basis of the specimens that they collected, Jentink described no less than twelve new forms, some of which are still regarded as valid, while others are synonyms of names previously applied to West Coast species; for a number of the species had already been named from specimens sent to England from Sierra Leone, or are identical with those ranging to the Gold Coast which were reviewed or described by Temminck in 1853, in his Esquisses Zoologiques sur la Côte de Guiné. This work was based largely on collections sent to Leyden by the Dutch naturalist, Pel, in the employ of a trading company with quarters on the Gold Coast, whose fauna is very much like that of the adjacent regions. Temminck described many of the mammals of this coast as new and his names in many cases are found to be available for the West Coast forms of species originally known from Fernando Po or from farther southeast on the mainland as in the Cameroon country; for the forest fauna of western Africa, from the Congo basin to the Cameroons, and extending northwestward in a narrow coastwise strip from the latter region to Sierra Leone, is more or less of a unit as contrasted with the plains fauna of the grasslands and thorn bush, inhabiting the remainder of the continent from French Guinea to East and South Africa, and thence up on the west coast to Angola. Nevertheless, many forms of the coastal forest from Sierra Leone to Gold Coast are subspecifically distinct from their representatives farther east, in the Cameroons and the Congo basin. The coastal strip of forest that they occupy is relatively narrow, and is practically interrupted near Lagos forming a nearly isolated faunal area. It is broadest over Liberia, which it includes practically entire, as shown in Sir Harry Johnston's map (1906, vol. 2, p. 523). Examples of such species of wide distribution in the forest area, having representative forms in Liberia and the adjacent countries, are: —

Crocidura occidentalis cara
Cercocebus torquatus atys
Cercopithecus mona campbelli
Cercopithecus nictitans büttikoferi
Colobus badius badius
Colobus polykomos polykomos
Anomalurus fraseri derbianus
Aethosciurus poensis musculinus
Funisciurus pyrrhopus leonis
Heliosciurus rufobrachium maculatus
Protoxerus stangeri temminckii
Myrsilus aubinii salae
Euxerus erythropus maestus
Cricetomys gambianus liberiae
Mastomys coucha erythroleucus
Praomys tullbergi rostratus
Hybomys univittatus planifrons

No doubt a number of other Liberian mammals may be added to this list when our knowledge of their exact relationships is complete. We are describing also a local form of the short-haired bush-rat, *Hylomyscus.*

In addition to these species that are represented in the Liberian and adjacent forest areas by races distinct from their representatives in the Cameroons and Congo forests, there are a few which seem to be peculiar to the strip of heavily wooded country along the coasts of Sierra Leone and Liberia. Notable among these are the Pygmy Hippopotamus, Jentink's Duiker, and the curious Zebra Antelope, which appear to be wholly confined to the densely wooded parts of these two countries. One may imagine their distribution to have once been wider when the forests extended farther inland and were broadly continuous with the Congo rain-forest and perhaps stretched to the east coast. There has probably been a long period of progressive drying out during and since Pleistocene times resulting in the development of the Sahara Desert and in the retreat of the forest toward the more rainy portions of the western coast. Here, north of the Bight of Biafra, these species have been more or less cut off from the great forest of the Congo basin, so that there has been no exchange of forest-living types between them. Of smaller species that seem in like manner to be peculiar to this coastal forest are: —

Perodictius potto *Dephomys defua* *Hybomys trivirgatus*

Perhaps in part through this partial isolation from the larger forest area, there are a number of genera found in the Congo that apparently do not occur at all in the coast-forest extension from Gold Coast to Sierra Leone. Such are: the gorilla (*Gorilla*), *Galago* (unexpectedly), various small rodents as *Stochomys*, *Oenomys*, *Colomys*, *Idiurus*, *Zenkerella*, and such larger, hoofed mammals as the okapi (*Okapia*) and the forest pig (*Hylochoerus*). It is further interesting that the Liberian representatives of certain more widely-spread types are more primitive than those occurring outside this area. Thus the Pygmy Hippopotamus is a less specialized animal than its giant representative of other parts of Africa, while among the Colobus Monkeys, the extraordinary development of the white decorative fringes found in the central and eastern African species, is least marked in the Liberian *C. polykomos.*

The list that follows is intended to include all species of mammals whose occurrence in Liberia has been authenticated. The list published by Jentink on the basis of Büttikofer's work included ninety species to which Miller in 1900 added nine. Subsequently, Johnston (1906) in his two-volume work on Liberia, gave a very good general account of the Liberian mammalian fauna, and added a list of one hundred three names, some of which, however, are obviously synonyms of other included species, while others still are given provisionally, on admittedly unsatisfactory evidence, as the Hedgehog, two Hyenas, Lion, Rhinoceros, Forest Pig, all of which may eventually be found, particularly the first four, whose ranges may touch the eastern border of Liberia beyond the forest. Our list comprises one hundred one species, exclusive of the Cetacea, and of these, five (*Crocidura nigricans*, *Petalia arge*, *Hipposideros langi*, *Anomalurella* and *Hylomyscus*) are recorded for the first time from the Liberian area. The small number added to the list is in itself proof of the thoroughness with which Büttikofer and his associates collected. Their work, supplemented by the smaller collections made by Currie at Mount Coffee and at various points by British officials stationed in Liberia, probably gives a very fair picture of the mammalian fauna. Our own work was disappointing. On account of the constant rain, trapping for small mammals was difficult, as the bait and traps soon became unattractive, and the abundance of ants, which quickly destroyed the bait, added to the difficulties. Meat baits were covered with masses of ants in a very short time, while such specimens as were taken, were often destroyed almost before they could be rescued. Probably many of the small mammals are arboreal, thereby avoiding the sodden ground but others are doubtless equally ground-living, though seldom making definite runways or else avoiding the baits used. Only one, a race of *Hylomyscus*, appears to be new, and is here described. For each species we have given the reference to the original description and type locality, then a very brief diagnosis to aid in the identification of the different kinds of mammals by persons using the list, and finally a brief résumé of what has been published on the species in Liberia, with additional notes made by ourselves.

INSECTIVORA

SORICIDAE Shrews

Sylvisorex megalura (Jentink). Long-tailed Forest Shrew

Pachyura megalura Jentink, Notes Leyden Mus., vol. 10, p. 48, 1888: Schieffelinsville, Liberia.

A slender, long-tailed shrew, brownish above, gray below; there are four unicuspid teeth behind the large two-cusped upper incisor; tail without prominent bristly hairs.

This species was described as a *Pachyura*, and in current lists is retained in that genus, since no further specimens seem to have been secured beyond the type described by Jentink. We secured two others, one on the Du River and a second at Betala, both of which were brought in by the natives. One, an adult female, measures: total length 145 mm., tail 78, hind foot 16.5, ear, 9; it contained, July 30, two large embryos. The additional upper unicuspid tooth distinguishes it at once from the following species, while from *S. gemmeus irene* of the Congo region it is easily separated by its smoky brown instead of russet color.

Crocidura muricauda (Miller). Mouse-tailed White-toothed Shrew

Myosorex muricauda Miller, Proc. Washington Acad. Sci., vol. 2, p. 645, 1900: Mount Coffee, Liberia.

Slender and long-tailed, much as in the preceding species, but slaty gray above, pale below; three unicuspid teeth behind the first two-cusped upper incisor; the tail with a few short, scattered bristle hairs.

Hollister has shown that this species, described as *Myosorex*, is really a member of the genus *Crocidura*, in which the tail is unusually long for this ground-living group; he suggests that it may be closely related to the Congo species, *C. dolichura*, thereby extending the range of the animal considerably. The small foot, only 12.5 mm., will at once separate it from the preceding species without recourse to the skull characters. The type is the only known specimen.

Crocidura schweitzeri Peters. Schweitzer's White-toothed Shrew

Crocidura schweitzeri Peters, Monatsb. Akad. Wiss., Berlin, 1877, p. 187: Liberia.

A medium-sized shrew, dull brown above, slaty gray below; total length 138 mm., tail 49, foot 14.5, ear 9; mammae three pairs, inguinal.

This is perhaps the commonest of the Crociduras in Liberia. It was originally described from a specimen sent from Liberia by the Austrian collector, Schweitzer. An adult female was secured by Büttikofer in a grassy field at Cape Mount, and others from Schieffelinsville and Hill Town were described as *C. stampflii* by Jentink under the belief that they were a different species. Dollman (Ann. Mag. Nat. Hist., vol. 15, p. 526, 1915) has shown, however, that this name is but a synonym of *C. schweitzeri*. Miller has recorded it from Mount Coffee and we secured two others in the interior at Gbanga. Its range extends into Sierra Leone.

Crocidura büttikoferi Jentink. Büttikofer's White-toothed Shrew

Crocidura büttikoferi Jentink, Notes Leyden Mus., vol. 10, p. 47, 1888: Robertsport, Liberia.

Distinguished externally from the preceding species by its much shorter tail; total length 116 mm., tail 40, foot 15.

This shrew seems still to be known only from the type specimen, and may be told at once by its short tail.

Crocidura nigricans Bocage

Crocidura nigricans Bocage, Jorn. Sc. Lisboa, vol. 1, p. 29, 1889: Quindumbo, Angola.

Distinctly paler in tint than *C. schweitzeri*, the belly contrastingly gray; tail with abundant bristle hairs, foot small; total length 130 mm., tail 53, foot 12.5, ear 8.

A *Crocidura* obtained on the Du River, at our first camp, differs in its small foot, as well as in color and proportions from the other shrews known previously from Liberia and seems to correspond very closely with *C. nigricans* of Angola or perhaps with *C. boydi* of the Uele River. In the lack of authentic specimens of either for comparison, however, we have regarded it as representing the former, and give the measurements above. The second upper unicuspid is broader than the third.

Crocidura occidentalis cara Dollman. Large White-toothed Shrew

Crocidura occidentalis cara Dollman, Ann. Mag. Nat. Hist., ser. 8, vol. 15, p. 525, 1915: Jala, Sierra Leone.

Size large, total length 197 mm., tail 78, foot 19; grayish brown above, paler below; tail with many scattered bristle hairs.

An adult male of this large shrew was captured near Monrovia under some loose stones by the side of a cleared space, July 21, and is in process of moult with fresh hair coming in all along the dorsal area from the crown to the root of the tail. A second specimen was taken in the forest at Gbanga, where it seemed to have blundered into a trap set under a dead log near the roots of a large tree. Dollman has recorded two others taken on Mt. Barclay, Liberia, by R. H. Bunting.

CHIROPTERA Bats

PTEROPIDAE Fruit Bats

Eidolon helvum (Kerr). Yellow Fruit Bat

Vespertilio vampyrus helvus Kerr, Animal Kingd., vol. 1, pt. 1, pp. xvii, 91, 1792: no locality.

Large, forearm 125 mm.; body above and below, and upper side of legs to toes, brownish-yellow. Africa south of the Sahara.

Several of these bats were brought in to us by a native hunter on the Du, who had spied a small colony resting in the shade of a palm top. We did not meet with it elsewhere, though no doubt it is common at times. Büttikofer observed it only twice. Once at Buluma he watched a "swarm" of them until midnight about a silk-cotton tree standing by itself. They were silently feeding upon the blossoms and young shoots of the tree. One was shot late in October at Muhlenburg Mission on the St. Paul's River and later described by Jentink as a new species, *Leiponyx büttikoferi*, but it proved to be merely an old individual in which the claw of the index finger was missing. It was one of a number seen at dusk coming from the forest behind the mission and passing high overhead southward with a steady, almost owl-like flight. No doubt the fruiting season and blossoming of various trees has much to do with their local appearance.

Epomops buettikoferi (Matschie). Büttikofer's Epaulette Bat

Epomophorus buettikoferi Matschie, Megachiroptera, p. 45, 1899: Schieffelinsville, Liberia.

Size large, forearm in males about 100 mm.; color a uniform brown with a whitish belly; males have a large whitish tuft of hair at the shoulder. Sierra Leone and Liberia.

Andersen regards this as a species distinct from *E. franqueti* of Central Africa, from which it is distinguishable by its slightly larger size and by having the third cross-ridge of the palate broadly interrupted in the middle. It is perhaps but the northwestern race of that species. Büttikofer found a large tree in the graveyard at Robertport inhabited by "whole troops" of this bat resting by day in some of the branches. He secured specimens also on the St. Paul's, Junk, and Du rivers, and one of his specimens from Schieffelinsville later formed the type of the species. Miller's specimen of "*E. franqueti*" from Mount Coffee is referred by Andersen to the same, while the latter author notes specimens in the British Museum from Grand Bassa, Liberia, and from Sierra Leone.

Hypsignathus monstrosus H. Allen. Big-lipped Bat

Hypsignathus monstrosus H. Allen, Proc. Acad. Nat. Sci. Philadelphia, 1861, p. 157: "West Africa," assumed to be Gaboon.

Large, forearm 128–137 mm., males larger than females; color above and below sooty brown; muzzle greatly enlarged, naked mid-dorsally, the lips with large fleshy folds anteriorly. The West African forest region.

We saw this bat but once, when at dusk in late July a single one, easily identified by its large, squarely truncate head, flapped past our camp on the Du. Büttikofer found them more common near water, especially in colonies in the mangroves, but with the ripening of certain fruits seeking often the high forest or plantations to feed on soursops or mangos. It is apparently noisy, making known its presence with loud quacks. He mentions specimens from the Junk and Du rivers.

Epomophorus gambianus (Ogilby)

Pteropus gambianus Ogilby, Proc. Zool. Soc. London, 1835, p. 100: Gambia.

Similar to *Epomops* but smaller, forearm in males 87–93 mm., the skull with a long flattened rostrum, in which the length of palate is about 2.5 the width outside molars. Back of the canine there are three teeth above and five below. Senegal to Nigeria and Abyssinia.

Although this species is listed by Jentink as having been collected by Büttikofer on the Junk River, the forearm measurement given (four inches), indicates that these were probably *Epomops.* Nevertheless the species doubtless occurs in Liberia for Andersen lists specimens in the British Museum from Freetown, Sierra Leone, and the Gold Coast.

Micropteropus pusillus (Peters)

Epomophorus pusillus Peters, Monatsber. Akad. Wiss., Berlin, 1867, p. 870: Yoruba.

Size small, forearm about 53 mm., rostrum short and broad, cheek teeth three above and five below behind the canine, palatal ridges not forming transverse lines but the first a V-shaped ridge, the others incomplete and bordering a central groove; color brown, belly drab, the males with white epaulettes and small white tufts at base of ears. Gambia to Loanda, east to the Great Lake region.

Büttikofer secured five females at Grand Cape Mount and Little Gola, and Andersen has recorded a specimen sent to the British Museum from Liberia by Dr. McCloy in 1908.

Nanonycteris veldkampi (Jentink)

Epomophorus veldkampi Jentink, Notes Leyden Mus., vol. 10, p. 51, 1887: Buluma, Fisherman Lake, Liberia.

Similar to the preceding but fur slightly lighter. It is distinguishable by the peculiar characters of the skull, in which the tooth row does not extend to near the edge of the orbit, the distance from the eye to tip of nostrils is less than breadth at angle of mouth, and the four anterior ridges of the palate are transverse. The palate is widely expanded posteriorly.

Büttikofer was the first to collect this species which so far as known, is characteristic of the West Coast forest region from Liberia to southern Nigeria. Andersen in his monograph of 1912 lists but ten known specimens.

Myonycteris leptodon Andersen

Myonycteris leptodon Andersen, Ann. Mag. Nat. Hist., ser. 8, vol. 2, p. 450, 1908: Sierra Leone.

Small, forearm 61 mm., distinguished from other fruit bats by the teeth, five above and six below, posterior to the canine; color dark brown with a tawny-olive ruff on the fore neck. Sierra Leone and Liberia.

Under the name *Cynonycteris torquata* Jentink listed a specimen of this species procured by Büttikofer at Schieffelinsville on the Junk River, and a second specimen is recorded by Andersen from Sierra Leone. Probably it is the western representative of the Congo species, *M. wroughtoni.*

Megaloglossus woermanni Pagenstecher. Long-tongued Fruit Bat

Megaloglossus woermanni Pagenstecher, Zool. Anz., vol. 8, p. 245, 1885: Sibange Farm, Gaboon.

Small, forearm 43 mm., cheek teeth five above and six below, tail practically absent, fifth metacarpal much shorter than third; color dark brown, the males with a paler ruff about the neck. Liberia to Congo.

This is another species of the West African forest region, of which Büttikofer secured an adult female at Schieffelinsville in a native hut. Miller records two from Mount Coffee.

It is remarkable that in spite of many evenings spent watching for bats in Liberia we saw extremely few, only two of which were probably fruit bats. It is likely that during the rains, they to some extent migrate to other regions where food may be obtained.

EMBALLONURIDAE Free-tailed Bats

Saccolaimus peli (Temminck)

Taphozous peli Temminck, Esquisses Zool. sur la Côte de Guiné, 1853, p. 82: Boutry River, Gold Coast.

Largest of the Microchiroptera in Liberia, forearm 82–89 mm.; tail projecting from about the middle of the interfemoral membrane; color dark brown. West Africa.

It is odd that Büttikofer and his associates did not record this bat, for we found it common on the Du and Farmington rivers, appearing shortly after dusk, hawking for insects. Its flight is noticeably strong, with long, powerful, measured strokes of the wings, and often we saw them at a considerable height sweeping back and forth. Allen, Lang, and Chapin remark that the color of those secured in the Belgian Congo was rather uniform, but of the four skins we brought back, no two are alike. One is a uniform dark seal brown, a second is a much more reddish brown, a third is somewhat hoary with many white-tipped hairs, while the fourth is even more so, and has the tips of both wings white, that of the left side more than the right. After leaving the coastal region we saw no more of these bats during our journey into the interior although frequent watch was kept at evening. At Banga,[1] however, the keen eyes of one of the natives discovered two at the entrance to a hollow high in the trunk of a tree a few yards from our hut at noonday. These were dislodged and collected.

[1] The locality "Banga" employed in the chapters on Mammals and Birds refers to the more western Banga on the map, and not to the Banga that is on the border of French Guinea. [EDITOR.]

PETALIIDAE Hollow-faced Bats

Bats of this family are distinguished by the large oval ears with more or less semicircular or crescentic tragus, the sunken area on the rostrum into which the nostrils open, and by the long tail, wholly included within the membrane and terminating in a Y-shaped border.

Petalia hispida (Schreber)

Vespertilio hispidus Schreber, Säugthiere, vol. 1, p. 169, pl. 56, 1775: Senegal.

Small, forearm 38 mm.; fur long and fine, of a uniform dull brown; second lower premolar very small, upper incisors trifid. Across Central Africa.

Büttikofer secured one at Schieffelinsville, probably the one whose skeleton is recorded by Jentink in his Catalogue Ostéologique, 1887, p. 273, as *Nycteris macrotis*. We obtained a second at our camp on the Du River, July 27. In this fresh specimen the nose-leaf, chin, back of the tragus, and the rims of the base of the ears were orange yellow, a color character that does not appear to have been heretofore recorded and one that serves to distinguish this species in life from the next following, which it closely resembles externally. Its total length was 88 mm., tail 47, foot 9, ear 20.5.

Petalia arge (Thomas)

Nycteris arge Thomas, Ann. Mag. Nat. Hist., ser. 7, vol. 12, p. 633, 1903: Efulen, Cameroons.

Similar to the preceding but without orange edges to the foliar expansions, tragus very small; the second lower premolar large, equalling in height the anterior cusp of the first molar. Congo to Liberia.

We secured two specimens of this hollow-faced bat which seem to constitute the first record for Liberia and form an extension of its known range well to the northwestward, into the forest strip of the West Coast. One of our specimens was brought in while we were camped on the Du, August 2, the other was found in the deep forest at Gbanga, hanging up inside of a huge hollow tree trunk lying on the ground. This trunk was hollow from end to end and on looking into it we disturbed the bat, which retreated still farther into the middle of its length. By crawling into the trunk we were able to shoot the bat, which seemed to be the only occupant of this shelter. In a similar prostrate hollow trunk in the forest on the Du, we several times startled a single bat, undoubtedly of this genus, but on account of the difficulty of seeing into the darkness, the bat always evaded our attempts to capture it, and flew out and away into the recesses of the forest. Apparently these bats are more or less solitary in habit.

Petalia grandis (Peters)

Nycteris grandis Peters, Monatsber. Akad. Wiss., Berlin, 1865, p. 358: Guinea.

A larger species, similar in color of fur to the other smoky-brown members of the genus, but nearly double their size, forearm 57 mm. Zanzibar to West Africa.

Büttikofer secured a single male in a hollow tree on the Du, and we obtained another near our camp on the same river. It was hanging in a small underground cavern on the forested hillside, gullied out by stream action in time of heavy rains. In the same cavern were two *Hipposideros*. Our specimen was a female, measuring: total length 154 mm., tail 79, foot 13, ear 38.

HIPPOSIDERIDAE Horseshoe Bats

Hipposideros caffer guineensis Andersen

Hipposideros caffer guineensis Andersen, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 278, 1906: Como River, Gaboon.

Size medium, forearm about 52 mm.; color smoky brown, a horseshoe-shaped flattened noseleaf; width across molars 7–7.7 mm. Como River, west to Liberia.

Under the name *Phyllorhina fuliginosa*, Jentink recorded specimens secured by Büttikofer and his associates on the Junk and the Du Rivers, and Andersen refers three of the specimens recorded by Miller from Mount Coffee to this bat. It is larger than the following, which it somewhat resembles.

Hipposideros beatus Andersen

Hipposideros beatus Andersen, Ann. Mag. Nat. Hist., ser. 7, vol. 17, p. 279, 1906: Benito River, Cameroons.

Similar to the preceding but smaller, the forearm measuring from 42–44 mm., the tail much shorter, 20–22 instead of 27–32 mm., the length of skull about 16.9 instead of 18.5–19.8, the width across molars about 6.

This species had been confused with the preceding until 1906, when Andersen recognized its distinctness and discovered that at least one of those from Mount Coffee recorded by Miller as *H. caffer*, was of the same kind. We secured three other specimens, two of which were from the same underground cavern with *Petalia grandis*, hollowed out by torrential rains in the side of a forested hill near our camp on the Du. On entering this cavern, the *Petalia* was first seen, and at the sound of the collecting-pistol, the two *Hipposideros* flew out, one alighting in a second small hollow under an overhanging bank, where it was fairly dim, though not so dark as in the cavern. The second one flew away into the dimness of the forest, but when we returned to the spot the next day, we startled what was probably the same individual from the cavern, and it too flew to the identical spot under the bank from which we had the day before shot the first one. Evidently these particular spots were regularly used as resting places. Our third specimen was brought in by the natives at Paiata. This is perhaps a somewhat solitary species of the forest.

Hipposideros langi J. A. Allen. Woolly-haired Horseshoe Bat

Hipposideros langi J. A. Allen, Bull. Amer. Mus. Nat. Hist., vol. 37, p. 434, 1917: Avakubi, Belgian Congo.

A larger species, forearm 66.5 mm., with long woolly hair, sooty, grizzled with pale gray; horseshoe large, with two smaller lappets on each side, a small erect central projection, and a rounded shield at the posterior margin of the horseshoe, with a stalked spherical lobule in the middle. Belgian Congo and Cameroons to Liberia.

This seems to be another of the forest-dwelling bats of West Africa. Specimens from the Belgian Congo formed the basis of its description, and the Museum of Comparative Zoölogy has others from Ebolowa in the Cameroons. Our capture of a male in the interior of Liberia at Kassata, September 28, is the first record of it in the western extension of the forest on these coasts. There is a strong probability, however, that Temminck's *Phyllorhina cyclops* from the Boutry River, Gold Coast, is the same species. His description of the color and of the peculiar woolly hair and unusual nose-leaf, coincides perfectly, but the measurements given are far too small. Possibly through some mistake the dimensions as published were really of some other specimen, but if not then there must be a larger and a smaller species in the West African area that differ chiefly in size.

Our specimen was shot in a dark room of a disused house which we occupied for two nights. Our attention was attracted by hearing the loud swish of its wings entering the house about an hour before sunrise, and on later investigating, we discovered the bat hanging against the top of the whitened wall of a completely dark room. Evidently it had resorted here regularly for a considerable time for a small pile of droppings had accumulated under the spot, as well as a deposit of cockroach wings representing many individuals, of a light brown color, which Dr. Joseph Bequaert recognized as those of a flying instead of a ground-living species. Evidently the bat had caught these and brought them in to eat while at rest.

VESPERTILIONIDAE Vespertilionid Bats

Pipistrellus stampflii (Jentink). Little Thatch Bat

Vesperugo stampflii Jentink, Notes Leyden Mus., vol. 10, p. 54, 1888: Farmington River, Liberia.

Small, forearm about 27 mm.; light brown above and below, the fur everywhere dark slaty at the base. West Africa.

Apparently the small bat described by Jentink as *V. stampflii* differs in no way from the other common bat which he records as *Vesperugo nanus* (= *Pipistrellus*) except that its membranes were margined with white, a condition occasionally found as a chance variation in various species. The forearm measurement as published — 32 mm. — is shown by Miller to be a misprint for 27. We cannot see either that Miller's *Pipistrellus minusculus*, based on three specimens from Mount Coffee is really different. Evidently Miller was misled by Jentink's surmise that one of the three specimens compared with the type of *stampflii* was still smaller and slightly different in color, as might have been expected when compared with an old alcoholic specimen of twelve years before. The length of tail is said to be 24 mm. in the type of *stampflii* but it may be shrunken in alcohol, while in our series, it ranges from 28 to 33 mm. (measured in the flesh) and in *minusculus* is 31. The relationship of this common species to *P. nanus* (Peters), is doubtless close, but specimens of the latter from the East Coast of Africa are a little larger (forearm 32 mm.) and are paler on the under side. It may prove eventually that *stampflii* is the West African race of *nanus*. This is one of the species in which the baculum is not present.

At every native village in Liberia this little bat is well known and numbers were always brought to us when we asked the villagers to bring in bats. They are especially fond of spending the day underneath the masses of palm-leaf thatch of the native huts, a habit so well known to the people, that even the small children would run from hut to hut, carefully lifting up the thatch along the outside of the circular roofs, to be rewarded by the occasional discovery of a few sleepy *Pipistrellus*, which they would bring to us in triumph. At dusk, after it has become just too dark to see to shoot, these little bats drop from the edges of the roofs here and there and swinging back and forth once or twice, flit off into the night.

Eptesicus minutus (Temminck)

Vespertilio minuta Temminck, Monogr. Mammal., vol. 2, p. 209, 1835–1841: South Africa.

Small, forearm about 29 mm.; light brown above, grayish beneath. Africa, south of the Sahara.

There is but a single record of two adults, a male and a female, taken by Büttikofer and Stampfli on the Du River. Externally the species may be distinguished by the somewhat swollen lips and the coloration. It is a wide-ranging species.

Eptesicus tenuipinnis (Peters). White-winged Bat

Vesperus tenuipinnis Peters, Monatsber. Akad. Wiss., Berlin, 1872, p. 263: Guinea.

Small, forearm 30 mm.; body light brown above, the hairs only slightly darker basally; below, white, the hairs with brown bases; membranes translucent white.

Probably this is not uncommon on the West Coast, although but a single specimen was secured by Büttikofer and Stampfli, at Schieffelinsville on the Junk River. Miller, however, records a second from St. Paul's River. It chanced that a colony of these pretty little bats inhabited the old house where we made headquarters for a time in Monrovia. They gained entrance to some cavity in the brickwork of one side through crevices between bricks whence they would issue one at a time at intervals of a few seconds shortly after sunset, looking very ghost-like as their white wings showed momentarily in the half light before they left for the evening's hunt. By placing an insect net over the entrances to their retreat, we secured some twenty individuals, all the adults of which were females, some apparently still — July 15 — nursing young. This is a very much darker-furred species than *E. phasma* of the Sudan, which with its less sharply white membranes, may be the desert representative of it.

Kerivoula africana Dobson. Funnel-eared Bat

Kerivoula africana Dobson, Cat. Chiroptera Brit. Mus., p. 335, 1878: Zanzibar.

Small, forearm 29. 5 mm.; brown above, paler below.

Jentink records as of this species a specimen taken by Büttikofer and Stampfli at Hill Town on the Du River, at that time the second individual recorded. Since the type locality is Zanzibar, however, it seems likely that the West African representative is of some other race.

CARNIVORA

MUSTELIDAE Weasels, Martens, Otters

Lutra maculicollis Lichtenstein. River Otter; "Bush Dog"

Lutra maculicollis Lichtenstein, Arch. f. Naturgesch., vol. 1, p. 89, 1835: Kaffirland, South Africa.

The large brown otter, with well-developed claws on all four feet; the throat and belly are whitish. Africa.

Otters occur along the streams of Liberia and we saw a number of imperfect skins in the possession of natives. At Gbanga we found a large burrow under the roots of a great tree on the overhanging bank of a small stream in the forest which evidently was an otter's hole. Curious whining sounds from within evidenced the presence of young but although the adults eluded our traps, two very small young brought in to us soon after, on September 23, may have come from the same burrow. Their eyes were not yet open, and in color they were a buffy gray, slightly darker about the eyes. A similar one was shown us early in the month, by the commander of the local garrison, who was trying to bring it up as a pet.

Aonyx capensis (Schinz). Clawless Otter

Lutra capensis Schinz, Cuv. Thierreich, vol. 1, p. 214, 1821: Cape region, South Africa.

A small clawless otter; general color, brown, the hairs tipped minutely with whitish; sides of head, and the throat whitish. Africa south of the Sahara.

We saw nothing of this otter, though Büttikofer and his associates brought back specimens, and from the number of skins seen in the hands of natives, concluded that it was fairly common along the streams of Liberia. During the time of our visit, the waterways were too full to allow of much search for tracks along the banks.

VIVERRIDAE Civets, Mongooses

Civettictis civetta (Schreber). The Civet

Viverra civetta Schreber, Säugthiere, vol. 3, p. 419, pl. 111, 1778: Guinea, etc.

When adult, about 1300 mm. long, of which the tail is about 840; facial mask, feet, two narrow stripes from base of ear to sides of neck, a median black line from shoulders to tail, and the tail, black; inner sides of ears buff, body grizzled blackish and buff, the markings on the flanks running to some five or six indistinct alternating bands of grayish and black. Africa south of the desert.

Although the Civet of eastern Africa has been regarded as a distinct race and has been given the name *Viverra civetta orientalis* by Matschie, this name is preoccupied by *Viverra orientalis* of Hodgson (Calcutta Journ. Nat. Hist., vol. 2, p. 47, 1841) for an Indian species and has lately been replaced by *schwarzi* Cabrera. In Liberia Büttikofer secured specimens at Robertsport, Bavia, and on the Junk and the Du rivers. A very young one was brought to us at Gbanga on September 25, but otherwise we did not meet with it.

Genetta johnstoni Pocock. Johnston's Blotched Genet

Genetta johnstoni Pocock, Proc. Zool. Soc. London, 1907, p. 1041, pl. 54, figs. 1, 2.

A genet with relatively short hair; tail with eight black rings, alternating with shorter pale rings; ground color ocher yellow to sandy gray, with spots on sides reddish, forming distinct lengthwise rows; a black spinal stripe; limbs dark.

This is probably a local race of *G. pardina*, to which the specimens secured by Büttikofer at Buluma, and on the Junk and Cess rivers were referred by Jentink. Pocock has named the Liberian animal as a distinct race on the basis of native skins from the interior of the country obtained by Leighton.

Poiana richardsoni liberiensis Pocock. Linsang

Poiana richardsoni liberiensis Pocock, Proc. Zool. Soc. London, 1907, p. 1043, pl. 54, fig. 3: interior of Liberia.

A small genet with tail longer than head and body; ground color rich yellowish fawn, the body marked with four or five longitudinal rows of dark oblong spots; tail with about twelve black cross-bands alternating with white ones; under surfaces of body white.

This species was recorded from Liberia for the first time by Pocock, who based the description of the Liberian race upon six skins collected by Leighton. The illustration indicates that these were native flat skins with the head as usual, removed. Pocock mentions another specimen in the British Museum supposed to have come from Sierra Leone. In the typical *P. richardsoni* the white of the under parts is more creamy and the ground color above is darker than in *liberiensis* (the name first used by the describer, although on p. 1045 in his summary key, he inadvertently uses instead the name *leightoni*).

Genetta poensis Waterhouse. Dark Genet

Genetta poensis Waterhouse, Proc. Zool. Soc. London, 1838, p. 59: Fernando Po.

Ground color buffy gray, with numerous small blackish-brown spots on the body tending to be arranged in lengthwise rows; feet and belly blackish brown; tail with several dark bands alternating with paler ones.

Pocock (1907a) includes a description of an adult skin in his report on Liberian mammals collected by Leighton, and figures this in his Plate 54, fig. 4. In its predominantly dark color it resembles the Cameroon *G. aubryana* of which it is doubtless a close relative. At Gbanga the junior author secured the skin of a kitten from one of the natives, as well as an adult skin.

Nandinia binotata (Gray). Palm Civet; "Raccoon"

Viverra binotata Gray, Spic. Zool., vol. 2, p. 9, 1830: Ashanti.

Length of adult about 1000 mm.; ground color above grizzled gray faintly washed with buff or tawny, under parts paler; about five rows of rounded spots on sides of body; tail long, annulated, the rings frequently incomplete. Two small pale shoulder spots are diagnostic. West African forest area.

The two small pale spots on the shoulders are a distinctive mark of this tree civet, whose feet are specially provided with roughened pads for help in climbing. We did not meet with this species although Büttikofer secured specimens, two of which were kept alive for some time as kittens and became very tame, climbing up the table-leg to eat food at meal times. When no bigger than rats, they pursued the rats that infested the house and presently rid the place of them altogether.

Galerella melanura (Martin)

Cynictis melanura Martin, Proc. Zool. Soc. London, 1836, p. 56: Sierra Leone.

A small slender mongoose, grizzled ochraceous and black, with a black tail-tip. Sierra Leone to Gold Coast.

Stampfli secured two small mongooses in Liberia, one each on the Junk and the Farmington rivers. These are referred by Jentink to *Herpestes gracilis* but probably are the same as *G. melanura* of Wroughton's revision of the members of the *gracilis* group (Ann. Mag. Nat. Hist., ser. 7, vol. 20, p. 110, 1907). He mentions also specimens in the British Museum from Ashanti and the Gold Coast and regards this as a distinct species. We saw nothing of it.

Atilax pluto (Temminck). Marsh Mongoose

Herpestes pluto Temminck, Esquisses Zool. sur la Côte de Guiné, 1853, p. 95: Dabacrom, Gold Coast.

A large species with uniform dark-brown coloring, much darkened by long black hairs; head minutely grizzled with gray, the sides with rufous; feet blackish brown, under fur grayish brown. West African forest area.

Jentink records as *Herpestes pluto* specimens from the Junk and the Du rivers obtained by Büttikofer and his associates, but makes no special comments. The late J. A. Allen recognized the marsh mongooses as forming a separate genus, *Atilax*, distinguished from *Herpestes* by the large size, generally dark color, free instead of partly united toes, first digit of each foot present, premolars only three above and below. He described, besides the well-known species *paludinosus* of South and East Africa, a larger-toothed animal which he named *macrodon*, from the West African forest area. This should perhaps stand rather as a subspecies of *A. pluto*, although actual intergradation is not yet shown.

We secured a single specimen of this large mongoose at Gbanga, but on at least two other occasions single animals were seen, one in the early forenoon the other in the heat of midday, the latter trotting leisurely along the trail at the edge of the forest. While travelling, this mongoose holds the tail slightly curved upward in a characteristic manner. An interesting feature of our specimen is that it has a very small first upper premolar on each side, showing that this tooth may sometimes be present, although its usual absence is one of the chief reasons for elevating the group to generic rank. The skull measures: condylobasal length 105.5 mm., basal length 100, zygomatic width 61, mastoid width 41.3, upper cheek teeth 39.8, across molars 37.5.

Miller has recorded as *H. galera* a skull from Mount Coffee.

Crossarchus obscurus F. Cuvier. Short-tailed Mongoose

Crossarchus obscurus F. Cuvier, Mammifères, part 47, pl. 199, 1825: Gambia.

Size large, about as large as the preceding, but tail short, about two-fifths of total length; color a grizzled brown. West Africa.

This seems to be a common species in Liberia. Büttikofer secured several specimens and mentions three young from one nest at Robertport. He notes that it is often kept tame in the houses of the natives and we saw this at several places. At Paiata a youngish one had the run of the village, and frequently visited our quarters to pick up bits of meat from the specimens being prepared, or would eagerly lay hold of a large carcass if one were being skinned, and tug away at it as if it really expected to carry it off. Not only did it eat meat greedily but it liked crackers too, and when given a piece would hold it down with its fore feet and bite off portions. Although only its milk teeth were in place, these seemed useful in seizing and tearing its food. Its utter fearlessness was one of its attractive characteristics at this stage, for it showed no sign of timidity even if a crowd of natives gathered about, as often happened, but ran in and out among them with perfect composure. The claws of the fore feet are unusually large in this mongoose and indicate that it is a good digger, although we saw nothing of its habits in a wild state. Büttikofer, however, mentions that it makes round holes in the ground in digging out the larvae of beetles. It is of diurnal habits.

FELIDAE Cats

Felis pardus reichenowi (Cabrera). West African Forest Leopard

Panthera pardus reichenowi Cabrera, Bol. Soc. Españ. Hist. Nat. Madrid, vol. 18, p. 481, 1918: Yoko, Cameroons.

A leopard with the ground color of the body a dull buffy, darkened along the back.

In his notes on the African leopards, the late Dr. J. A. Allen showed that the race *F. p. leopardus* is based on the leopard of Senegal, so that it seems unlikely that the animal of the West African forest region should be the same. We are therefore using for it Cabrera's name, based on the Cameroons animal, assuming it to be the same as that of Liberia. Several skins were seen in the hands of natives, one of which was bought and seems to be of a peculiar dull aspect in the median area, darker than available skins of the East African leopard.

This is a rather common species throughout the forested country traversed, and occasionally carries off a dog or a goat. We did not see it alive, though tracks were found, sometimes close to the villages. Büttikofer mentions that one carried off a goat from the mission at Robertport, and that young ones now and then are brought to the coast for sale by the natives.

Pocock (1907) has called attention to the peculiar dusky (rather than yellowish) shade of leopards from Sierra Leone and Ashanti due to the grayer hue of the pale interspaces and the closeness of the spots.

We were shown the skin of a leopard that had been killed just before our arrival at a Firestone plantation by one of the men in charge, who, coming from a short hunt in the forest at dusk carrying a dead monkey, found himself followed by a leopard. Although armed only with a shotgun, he succeeded in killing it with heavy shot.

Felis serval togoensis Matschie. West African Serval; "Tiger"

Felis serval togoensis Matschie, Sitzb. Ges. Naturf. Freunde Berlin, 1893, p. 109: Bismarkburg, Togo, West Africa.

Smaller and slenderer than a leopard; ground color yellowish or ochraceous buff, with about five median lengthwise black lines forming broken narrow stripes, below which are about as many rows of larger oval spots of black, those on the haunches largest; tail about ten inches long with about six black rings alternating with yellowish ones. West Coast forest.

Servals are well known from Sierra Leone and Liberia, but we were unsuccessful in securing fresh specimens. The junior author, however, purchased two skins from the natives, at Gbanga and Bashman Kulu, which are a much richer yellowish than a similar skin from Ruanda, Congo, representing *F. s. faradjius* J. A. Allen. Of the various names applied to servals from West Africa, J. A. Allen and others have shown that *galeopardus* is unidentifiable and *senegalensis* is preoccupied for the lion (although later replaced by *pococki* Cabrera, 1910). Matschie's name, *togoensis,* is apparently therefore the next available for the form of the West Coast forest.

Felis ogilbyi ogilbyi Schinz. Servaline Cat

Felis ogilbyi Schinz, Synopsis Mamm., vol. 1, p. 469, 1844: Sierra Leone.

Resembling the serval, but the spots much more numerous and very much smaller. Equatorial Africa.

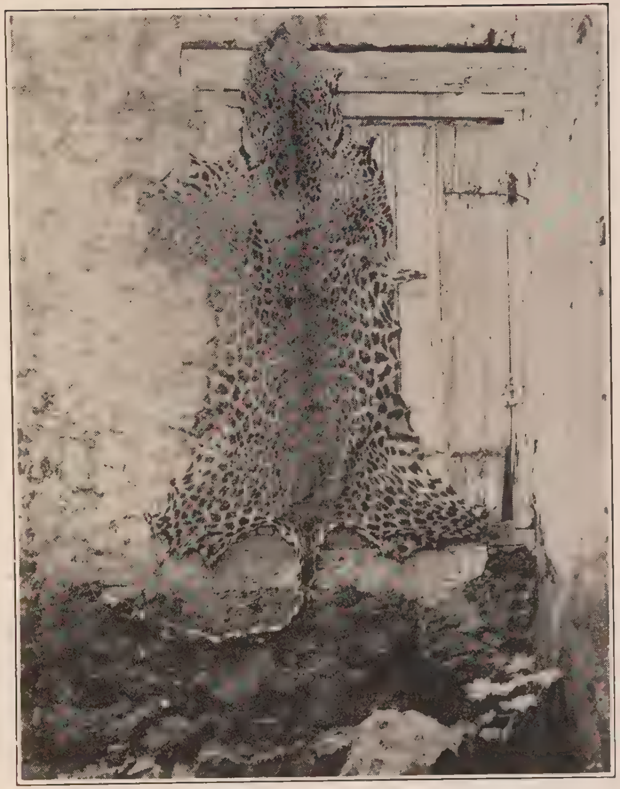
Undoubtedly this cat occurs in Liberia, for the type locality is Sierra Leone and it seems to be a forest-dwelling species of Central Africa. We are unable to give positive evidence of its presence, however. The finely speckled pattern of spots is now believed to be a characteristic distinguishing it from the serval.

Felis aurata Temminck. Golden or Tiger Cat

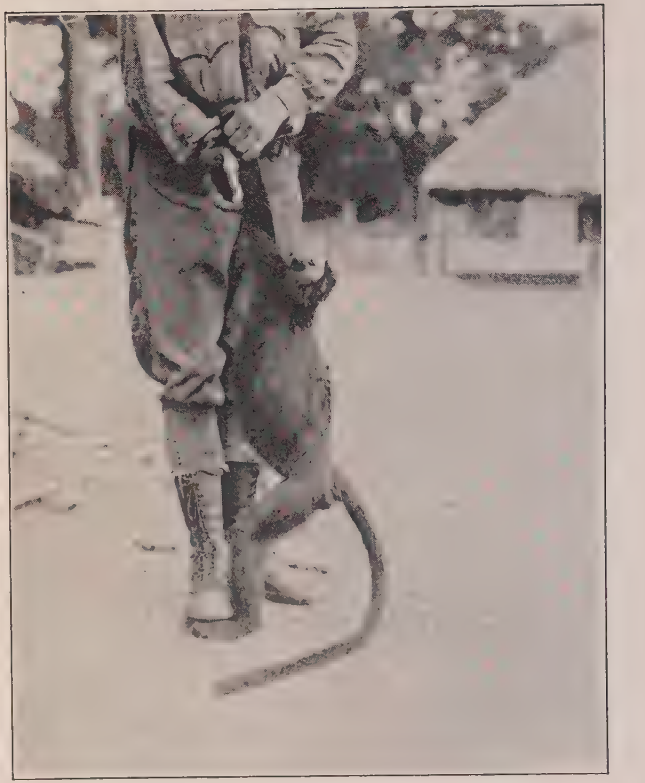
Felis aurata Temminck, Monogr. Mammal., vol. 1, p. 120, 1827: no locality.

Body either gray-brown or reddish, nearly unspotted or with indistinct spots on the flanks; tail banded. Size about as large as a serval but less slender. Sierra Leone to the Congo.

This forest cat occurs throughout its range in two color phases, a reddish and a brownish gray, usually with indistinct spotting, or the spots confined to the flanks. The junior author purchased a native skin at Zugi Town, in eastern Liberia, in the brown phase, with the ground color brownish gray, much darker medially, the entire body covered with rounded spots of a deeper brown. Sir Harry Johnston has recorded both the red and the brown phases from Liberia and figures the latter in color in his work on Liberia. Büttikofer secured specimens from the Farmington River and at Bavia, and mentions having seen it hunting in tall grass near Buluma. Probably the name *celidogaster* is applied to the grayish-brown phase of this cat.



No. 444. – Skin of *Felis pardus reichenowi* Cabrera, Liberia



No. 445. — *Colobus badius* (*ferrugineus*)

PRIMATES Monkeys and Lemurs

LORISIDAE Loris, Pottos, Galagos

Galagoides demidoffi (G. Fischer)

Galago demidoffi G. Fischer, Mém. Soc. Imp. Nat., Moscow, vol. 1, p. 24, 1806: Senegal.

A small lemur with long ankles; grayish brown above, becoming slightly reddish in the center of the back; lower surface of body washed with yellow; a pale area on the center of the muzzle, bordered by two narrow black lines between the eyes. West and Central Africa.

In the forests of Liberia this small galago is apparently common for a number of young ones were brought in to us at Gbanga during the month of September, some of these in the latter part of the month very small. We tried to feed them on milk but with little success. They slept during the day but became more active at night giving from time to time sharp twittering noises of needle-like fineness. We once startled an adult while making our way along in deep forest where scattered bush and vine growth made a thicket-like tangle. The animal must have been on the ground, and giving a bound of several feet started making its way rapidly up the vines.

It is uncertain whether the animal of Liberia is identical subspecifically with that of Senegal, the type locality, or whether the form found on Fernando Po is the same. The latter has been named by Thomas (1904) *poensis* while Temminck in 1853 gave the name *Otolicnus peli* to the same species on the Gold Coast. Should specimens from Senegal prove different from the Liberian ones, as is likely in view of the different climatic conditions there, Temminck's name should be retained in a subspecific sense for those of the region from Sierra Leone to the Gold Coast. An anomaly of distribution seems to be the absence of the genus *Galago* from this part of Africa.

Perodictius potto (E. Geoffroy). Bosman's Potto; "Softly"

Nycticebus potto E. Geoffroy, Ann. Mus. d'Hist. Nat. Paris, vol. 19, p. 165, 1812: Guinea.

Size of a kitten; head short, rounded, index finger a mere stump, tail short; general color reddish brown. Sierra Leone to Gold Coast.

A fine adult was brought to us at Paiata that had been caught in a native monkey trap, made by cutting down trees to form a sort of bridge between two neighboring clumps and placing a noose in such a way that monkeys passing along the fallen trunks to reach the opposite group of trees will put their heads through the noose and be captured. The native name for this lemur is "Softly," and it is well known that they believe it is possessed of great strength in its hands, enabling it to choke to death the monkeys on which it is supposed to feed. The origin of the belief may be in the tightly clenched fingers of the dead animal. Büttikofer records a young one secured on the Junk and a young male at Soforé Place, but believes it is rare along the coast.

CERCOPITHECIDAE Baboons, Guenons

Cercocebus torquatus atys (Audebert). Sooty Mangabey; "Jocko"

Simia atys Audebert, Hist. Nat. Singes et Makis, fam. 4, sec. 2, p. 13, pl. 8, 1799: "Indes orientales," but probably West Africa.

Sooty gray with white eyelids; last lower molar with five cusps; second and third toes united for nearly their entire length. Sierra Leone and Liberia.

Büttikofer writes that these monkeys are only seldom met with and that they spend much time on the ground seeking their food. He secured specimens at Bavia, Grand Cape Mount, and on the Junk and the Du rivers. Our experience was similar for we saw the species perhaps once in the wild state, in contrast to the other genera of monkeys that were comparatively common. On the other hand it is the species most commonly seen as a pet about the houses of the townspeople as well as in the native villages. It seems to be much more tractable than the guenons and makes a more interesting and confiding pet, with its alert and mischievous ways. One we kept for a while was active and responsive, and became a general favorite. When standing at attention the long tail is held curved forward in an arc over the back. A well-grown one at Monrovia was kept tame at a neighboring house, and escaped its youthful owner, whose efforts to recapture his pet were the more amusing as the monkey seemed to enter into the game, allowing him to come almost within reach and then just eluding his hand. The smaller children it delighted to frighten by making sudden mock charges toward them. It was fond of hibiscus blossoms, pulling them off and eating the lower part.

Cercopithecus callitrichus I. Geoffroy. Green Guenon

Cercopithecus callitrichus I. Geoffroy, Cat. Primates, p. 23, 1851: no locality.

Hair on cheeks radiating from a point, no white eyebrow band; grizzled black and yellow above becoming grayish on forearms and lower legs; cheeks and under parts white; tail grayish yellow at base, yellow terminally. Senegambia to the Congo.

Although this monkey is said to be common in Senegambia and Sierra Leone, Liberia is supposed to be its southern limit on the coast. The only record is that of Büttikofer who once observed it, at Buluma, where he shot a male close to the mission station, while on his second expedition he had a female in captivity that he secured on the Junk River and later took to Europe.

Cercopithecus mona campbelli Waterhouse. Campbell's Guenon

Cercopithecus campbelli Waterhouse, Proc. Zool. Soc. London, 1838, p. 61: Sierra Leone.

A black mark from eye to back of ear; head grizzled yellowish and black becoming more reddish over the shoulders; lower back slaty, finely grizzled with yellowish; forearms and feet black; tail mixed black and yellow. Sierra Leone and Liberia.

In his recent review of the described forms, Schwarz considers this a subspecies of the Mona Monkey. It is perhaps the commonest species in Liberia, occurring in small troops in the high forest, feeding in the tree tops. Usually there are one or two old males in the band whose double bark, like a gruff cough, is often the first warning the intruder has of their presence. Büttikofer mentions their going at times in troops of as many as fifty; yet we never saw such large companies but usually ten or a dozen. One little band lived in the high trees near our station at Gbanga and might be found almost any day feeding in the intermediate heights. By moving very carefully it is often possible to get among them, and we secured several specimens. Büttikofer says that he once caught one from a canoe that was swimming the Marfa River.

Cercopithecus nictitans büttikoferi Jentink. Büttikofer's Guenon

Cercopithecus büttikoferi Jentink, Notes Leyden Mus., vol. 8, p. 56, 1886: Liberia.

Entire upper parts grizzled black and reddish, becoming yellowish at the sides, and gray on the limbs; a triangular spot on the nose white; face black, as well as a line from brow to ear and another from eye to side of neck, enclosing a white stripe; body and tail white below, inside of fore limbs gray.

At first sight this monkey somewhat resembles the preceding, but the entire back instead of only the upper half is speckled, and the tip of the nose has a triangular white spot that is conspicuous at a considerable distance. We were unable to detect any difference in the habits of the two species. A young one, but a few weeks old at most, was brought in to us on the Du, August 16, and a slightly older one at Gbanga, September 12. They were uninteresting pets, rather stolid and distrustful. It is a common species in the forest area of Liberia. Schwarz follows Elliot in regarding Jentink's *Cercopithecus stampflii*, described from one specimen secured in the Kpwesi country of Liberia, as a synonym of *C. n. martinii*, but since the type locality of the latter is the island of Fernando Po, it is evidently best considered as identical with *C. n. büttikoferi*.

Büttikofer secured specimens from Bavia, Muhlenburg, Soforé Place, Cape Mount, the Junk and the Du rivers; we saw it at various places along our route and secured specimens at Gbanga, Betala, Tappi Town, and on the Du.

Cercopithecus diana diana (Linné). Diana Monkey; "Dandy Jack"

Simia diana Linné, Syst. Nat., ed. 10, vol. 1, p. 26, 1758: no locality.

Above finely speckled black and yellowish, the middle of the back clear chestnut red; legs and tail black, with a prominent line of longer buff hairs at the hip; inner side of hind legs bright chestnut; throat white, with a small beard, chest and belly black. Sierra Leone and Liberia.

This handsome monkey is not uncommon in the Liberian forests, but we saw rather few, these usually single ones or small companies. Its voice is different from that of the Campbell's Guenon. A female shot July 13 contained a fairly large foetus. Büttikofer secured specimens from Bavia, Soforé, Cape Mount, and on the Junk and the Du rivers. We more than once saw a single one climb out to the ends of branches to gaze at our porters marching along the forest trail, but they at once retreated if one stopped to look at them.

COLOBIDAE Colobus Monkeys

Colobus badius badius (Kerr). Red and Black Colobus; "Lion Monkey"

Simia (*Cercopithecus*) *badia* Kerr, Animal Kingdom, vol. 1, p. 74, 1792: Sierra Leone.

Crown to base of tail, and upper part of arms and legs, shining black; under parts from chin to tail, and the limbs chestnut; tail chestnut mixed with black, especially terminally. Sierra Leone and Liberia.

Common and generally distributed in the high forest of Liberia. We saw a good many in small troops. The stomachs of two that we opened were filled with finely chewed green leaves and they probably eat certain forest fruits as well, for on one occasion we surprised a company of fifteen or twenty in a large tree that bore an abundance of ripe pulpy fruits. On seeing us they made off with magnificent leaps, dropping twenty or thirty feet to branches below, one after the other. Their call of alarm is a series of five or six short barks quite different from the gruff double utterance of the Campbell's Guenons. At Gbanga on September 4 an adult female was brought in containing a small foetus and on the 10th at the same place another with a larger fetus in which the hair was beginning to appear. The native hunters are skillful in securing these monkeys, and sometimes attract them within shot by imitating the squeals of a young one.

Colobus polykomos polykomos (Zimmermann). Ursine Colobus; "Black Monkey"

Cebus polykomos Zimmermann, Geogr. Geschichte, vol. 2, p. 202, 1780: Sierra Leone.

Face, sides of head and throat silvery, a fringe of long silvery hairs extending to the axilla; rest of the body shining black, the tail contrastingly white. Sierra Leone and Liberia.

It is interesting that in the West Coast forest area where so many rather primitive types are found, the black and white colobus monkey should be one of the least specialized in the development of the white fringe, which culminates in the extraordinary display of the East African *C. caudatus* with its shawl-like mantle and heavily tufted tail. Büttikofer believed this was slightly less common that the preceding species and this was practically our experience, though it is not rare in the high forest, where it seems to be generally distributed. It is represented by a very slightly different subspecies in the forest area of the Ivory Coast. J. A. Allen (Journ. Mamm., vol. 1, p. 96, 1920) showed that both these colobus monkeys were named on the basis of specimens in the old Leverian Museum brought from Sierra Leone. The present species is the *C. ursinus* of Jentink's list, and the preceding is the one generally known as *C. ferrugineus.* Jentink also describes a young *Colobus* which differs from the adult of *C. polykomos* in that the coloring is nearly reversed with the back white and the tail black at base and tip. Undoubtedly this is a young of the species for it is now well known that the young of these monkeys are very differently colored from the adults.

Colobus verus Van Beneden. Van Beneden's Guereza

Colobus verus Van Beneden, Bull. Acad. Sci. Bruxelles, vol. 5, p. 344, p. 115, 1838: "Africa."

Head with reddish-olive crest; band on forehead and sides of face pale yellow; neck and back, arms and thighs grizzled olive brown and black; nape and anal region tinged with reddish; throat white, under parts ashy gray; hands, feet, and base of tail reddish brown, rest of tail olive brown. Gold Coast to Liberia.

This must be a rare species, finding its northern limit in Liberia or possibly Sierra Leone. Büttikofer is the only collector to secure it in the Liberian forests. He procured an adult male at Schieffelinsville on the Junk River and a female at Grand Cape Mount, the latter shot from a tall mangrove tree. In its general coloring it so resembled *Cercopithecus callitrichus* that he at first took it to be that species, but the very short thumb would always distinguish the two with the specimens in hand. This is the *C. cristatus* of Johnston's list.

SIMIIDAE or **PONGIDAE** Anthropoid Apes

Pan satyrus (Linné). Chimpanzee

Simia satyrus Linné, Syst. Nat., ed. 10, vol. 1, p. 25, 1758: Gaboon.

The well-known chimpanzee is a large tail-less ape, black with usually a small tuft of white hair on the buttocks. Although a number of species or races have been named, it is not certainly known which if any of these are valid, for most of the characters ascribed to them seem to be largely matters of individual rather than geographic variation. For the present therefore we refrain from using a trinomial, although the name *leucoprymnus* is applicable, if valid, to the Liberian chimpanzee. It is curious that in all our journeys through the forest trails of Liberia, we only once came upon chimpanzees, although they are apparently found throughout the country in primeval forest. At Tappi Town, in extreme eastern Liberia, the junior author saw chimpanzees in the forest and heard a rapping sound which the natives said the animals made by beating on hollow logs. The chief of the village requested that none be shot, because the natives believe that every chimpanzee is linked with the soul of a man, so that if one is killed the man will die. At Monrovia one or two were seen in capitivity, and made affectionate pets. Most of these tame ones seem to come from the southeastern part of Liberia especially the Cavalla River. Büttikofer had two young ones from Grand Bassa and the River Cess, but secured an adult male also on the Du River and a skull from Fisherman Lake in the northwestern corner of Liberia. He mentions further that in November, 1881, a troop of chimpanzees was several times heard on the mountain back of Robertport though none was seen. They are said to drum on their chest with the clenched fist when angry and to make a horrible noise, but apparently Büttikofer had no personal evidence of this habit, and it is generally regarded as more characteristic of the Gorilla. In Liberia this is generally called "Báboon," with the accent on the first syllable.

RODENTIA Gnawing Mammals

ANOMALURIDAE Scaly-tailed Squirrels

Anomalurus beecrofti Fraser. Beecroft's Flying Squirrel

Anomalurus beecrofti Fraser, Proc. Zool. Soc. London, 1852, p. 17, pl. 32: Fernando Po.

Size medium, length about 18 inches; above, a mixed black, gray, and yellow, the last predominating over the back, giving a greenish tinge; a white mark in the middle of the forehead; below, the chin is gray, throat, body, and hind legs washed with orange rufous, the fore legs and sides of body and membrane buffy, becoming dusky at the edges. West African forest.

The scaly-tailed flying squirrels appear to be largely nocturnal and so are rarely seen. Of this medium-sized species, Büttikofer and Stampfli secured three on the Du River. The former notes that he occasionally heard their twittering cry from the tops of the forest trees at night, and for a long time supposed it was made by lemurs. They are said at times to rest by day clinging closely against the trunk of a tree but so much resemble a flake of loose bark as easily to escape detection. One of Büttikofer's specimens was from a fallen hollow tree in the forest.

Anomalurus fraseri derbianus (Gray). Derby's Flying Squirrel

Pteromys derbianus Gray, Ann. Nat. Hist., vol. 10, p. 262, 1842: Sierra Leone.

A larger species, chiefly reddish brown above; head and body 14 inches.

We did not see this species, but our native hunters assured us that the large flying squirrel was occasionally found in the forests. Büttikofer and Stampfli obtained it from the region of the Du and the Farmington rivers. Doubtless Gray's name, *Pteromys derbianus*, based on a large species from Sierra Leone, is the representative of *fraseri* in this region. Matschie has also described as *A. auzembergeri*, a large flying squirrel from the middle Cavalla River, on the border of the Ivory Coast, which is perhaps the same.

Anomalurella pusilla batesi (De Winton)

Anomalurus batesi De Winton, Ann. Mag. Nat. Hist., ser. 6, vol. 20, p. 524, 1897: Como River, Gaboon.

Small, total length about 375 mm., tail 155; above, a warm brownish gray; below, gray on the throat, center of body, and lower legs, whitish at the sides; chest washed with pale yellow.

A single adult female was brought in to us that had been killed by a crew of natives at work felling the primeval forest on the Du River Firestone plantations. It does not differ so far as can be told from descriptions, from the Gaboon animal described by De Winton, and forms a considerable extension of the known range of the species, which is now definitely added to the forest fauna of the West Coast.

SCIURIDAE Squirrels

Aethosciurus poensis musculinus (Temminck). Green Bush Squirrel

Sciurus musculinus Temminck, Esquisses Zool. sur la Côte de Guiné, p. 142, 1853: Guinea Coast.

Small, with narrow tapering tail; general color a finely grizzled mixture of black and greenish yellow, clearer yellowish below, giving a general greenish appearance. West African forest region.

Compared with specimens from the Cameroons taken to be the same as *A. poensis* of the island of Fernando Po, the Liberian examples of this bush squirrel are of a much warmer tone, suffused above with a ruddy brown, noticeably different from the paler greenish color characterizing the more eastern animal. The yellowish wash of the lower surface of the body is also deeper, almost ochraceous. We are therefore reviving for this squirrel, Temminck's name *musculinus*, for in his brief description he particularly mentions the coloring as grayish black, finely punctate with "un roux vif," which hardly applies to the Cameroon race but indicates well enough the warm brown tone of the more western squirrel of the rain forest area of Liberia and adjacent parts, for the description was doubtless based on specimens collected by Pel on the Gold Coast.

Hollister in his review of East African mammals, regards *Aethosciurus* as a genus closely related to *Heliosciurus* or even doubtfully distinct from it, for the presence of an additional small upper premolar is a relatively slight character. Nevertheless the peculiar greenish coloring, tapering tail, and the habits are distinctive. It is a squirrel of low bushy growth or it frequents the tangles of vines enveloping trees at the open edges of forest, instead of the high forest trees themselves. More than once we saw single ones crossing from one low tree to another on connecting vines in the bushy second-growth. When once startled, they seldom stop to look back but at once hurry away and hide among the tangled masses of vines and leafy twigs. Specimens were secured at Paiata, Banga, and Tappi Town, but none was seen in the heavier growth. Miller records an imperfect specimen from Mount Coffee, and observes that it is different in appearance from Cameroon specimens.

Funisciurus pyrrhopus leonis Thomas. Red-legged Bush Squirrel

Funisciurus pyrrhopus leonis Thomas, Ann. Mag. Nat. Hist., ser. 7, vol. 15, p. 79, 1905: Bo, Sierra Leone.

Length about 350 mm.; from nose to base of tail a fine mixture of black hairs and hairs tipped with greenish yellow; a pale ochraceous flank stripe, and below it a black stripe; sides of face and body including the legs bright ferruginous; tail black above, mixed with white, the white-tipped hairs forming a narrow border; below, the tail is ferruginous in the center, while the under parts of the body from chin to base of tail and inside of the limbs are white to the roots of the hairs.

The form of Red-legged Bush Squirrel occurring in eastern Sierra Leone is said to differ from the race of the Gold Coast, *F. p. leucostigma*, in having the flanks a richer rufous. In typical *pyrrhopus* of the Cameroons, the limbs only are rufous.

This is the squirrel most often seen in Liberia. It frequents low thick trees along the streams especially, or the scrubby second-growth on the edges of higher forest, frequently coming to the ground and searching about for food or travelling from one thicket to another. We occasionally came upon it running ahead on the trail but at the least alarm, it will dash into the dense tangles on either side and disappear. It is of general distribution throughout the country, but avoids the deep forest except along the edges of the waterways. Büttikofer notes it about Buluma, and on the Junk and Du rivers, especially in small trees and about the palm orchards. He found their nests in the axils of oil-palm fronds about six feet from the ground, and composed of palm-leaf fiber. These nests would contain but two blind young, and these are often brought in by the natives. He speaks further of their frequenting the Raphia palms along the streams. Two, their eyes still unopened, were brought to us, August 6, on the Du. We watched one pair that had a nest in a vine-covered tree on the edge of a river, in primeval forest. The squirrels were watchful but frequently descended the few feet to the ground in search of food, retreating to their shelter if alarmed. In mid-July and in early October we had young brought to us that could have been but a few weeks old. One we kept for a few days alive frequently uttered a series of shrill barks, rising then diminishing in volume, somewhat like the notes of a Stone Curlew, more bird-like than mammalian. Specimens were preserved from the Du River, Paiata, Kakatown, Moylakwelli, and Towya, and Miller has recorded it from Mount Coffee.

Heliosciurus gambianus punctatus (Temminck)

Sciurus punctatus Temminck, Esquisses Zool. sur la Côte de Guiné, 1853, p. 138: Guinea.

Small, total length about 370 mm.; general color above minutely grizzled reddish, ochraceous, and black; below grayish; tail long and narrow, transversely banded with black and ochraceous or reddish above, tipped with black, the lower surface a mixture of the dorsal colors, without definite cross-bars. West African coastal area.

This is closely related to the following species, but unlike it, avoids in general the high forest, seeking instead the lower second-growth trees on the edges of the forests or the borders of old plantations and clearings. We secured two specimens, one on the Du the other at Paiata. It is apparently less common than the other species of its genus and quite as shy, usually seeing us first and quickly running away from tree to tree till lost among the thick foliage. Büttikofer and his associates collected it at Soforé Place and Buluma, as well as on the Junk River, while Miller records it from Mount Coffee.

Heliosciurus rufobrachium maculatus (Temminck)

Sciurus maculatus Temminck, Esquisses Zool. sur la Côte de Guiné, 1853, p. 130: Gold Coast.

A larger species than the preceding, total length about 490 mm.; above blackish minutely grizzled with ochraceous on the back and grayish on the limbs and sides; lower side of arms and legs rufous, throat gray, belly washed with rusty yellow; tail black, the terminal two-thirds above with some ten cross-bars of whitish-tipped hairs; lower side grizzled with white. Eastern Sierra Leone to the Gold Coast.

This is a squirrel of the high primeval forest, where its dark coloring harmonizes with the shadows of its habitat, or it may be found in the thinner borders of tall trees along the streams and on the edges of clearings. Büttikofer regarded it as the commonest squirrel in Liberia, but its preference for high trees and its wary habits make it less easy to secure. It usually sees the hunter first and makes off at speed along the big limbs or climbs dextrously among the tangles of hanging vines and easily makes good its escape. One that we shot on the Du, however, was so engrossed in eating the red seeds of a forest vine that it allowed a very close approach. At Gbanga we occasionally saw these squirrels in the big trees by the river where they seemed to be feeding on a small leguminous fruit, sought also by the parrots. Miller records it from Mount Coffee and names the form *libericus*, but this is regarded by Thomas as the same with the Gold Coast race.

Protoxerus stangeri temminckii (Anderson). Naked-bellied Squirrel

Sciurus temminckii Anderson, Zool. Researches Yunnan, 1879, p. 229, footnote; renaming *S. caniceps* Temminck of the Gold Coast, *nec S. caniceps* Gray.

A large squirrel, similar in general coloring to the last but larger, the tail not cross-banded, the lower surface only sparsely haired, the under sides of the limbs dull yellowish instead of rufous.

This large squirrel with its peculiarly sparse-haired under surface, is apparently rare in Liberia. Büttikofer and his associates collected it, however, at Bavia, Soforé Place, and on the Junk and the Du rivers, but found it always among the oil palms, on the fatty fruit of which it chiefly lives for part of the year at least, as do a number of other mammals and birds. This race of the West African coast is doubtless closely allied to the others of the rain-forest area to the west and south. We did not meet with it, perhaps because we were for most of the time away from the coastal districts where most of the oil-palm groves are.

Myrsilus aubinnii salae (Jentink). Sala's Squirrel; "Bush Cat"

Sciurus salae Jentink, Notes Leyden Mus., vol. 3, p. 63, 1881: Bavia and Soforé Place, Liberia.

A squirrel with a black dorsal stripe and long unringed tail; five upper and four lower cheek teeth.

This is the *Sciurus orbinii* of Johnston's list and *S. aubinnii* of Jentink. Thomas has erected a special genus for it, and regards *salae* as a distinct West Coast race of the typical form found in Fanti. The black dorsal area is said to be sometimes obvious, but again less so. We nowhere saw it, but Büttikofer sent home specimens from Bavia, Soforé Place, Bendo, and the Junk River. Its habit of living in hollow trees he believed to be characteristic.

Euxerus erythropus maestus Thomas. Ground Squirrel

Euxerus erythropus maestus Thomas, Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 419, 1910: Daru, 150 miles inland, Sierra Leone.

A medium-sized squirrel, with stiff coarse hair, and reduced external ears; middle of back and head dull earth brown, minutely ticked with whitish; a narrow white line from shoulder to hip, below which the brown of the back grades into the whitish under surface; feet light ochraceous; tail black mixed and bordered with white.

These ground squirrels are not rare in the neighborhood of villages and clearings, and often are seen foraging about, even in the hottest part of the day.

They are very alert, however, and not readily approached. When standing erect on their haunches, motionless, they may so closely simulate a dead stick of wood that they might easily be passed by. Several immature examples were brought in to us at Paiata, and we saw a few adults as at Suahkoko and Mericani. Büttikofer obtained specimens at Buluma and Robertport, and says they are commonest in the ground-nut plantations and new cassava farms, digging up the cassava and gnawing the rind. This is a burrowing species as its very small ears and powerful claws indicate.

MYOXIDAE Dormice

Claviglis crassicaudatus Jentink. West Coast Dormouse

Claviglis crassicaudatus Jentink, Notes Leyden Mus., vol. 10, p. 41, 1888: Du River, Liberia.

Superficially resembling a very small squirrel, total length about 175 mm., with nearly naked ears and flattened bushy tail, mammae 2 –2 = 8; general color above a warm grayish brown, below gray; tail drab.

Thomas in 1925, restricted the name *Graphiurus*, generally used for the small bushy-tailed African dormice, to the South African species, *G. ocularis*, so that the next available name for those species with larger upper premolar and more ridged teeth is Jentink's *Claviglis*, based on a stumpy-tailed specimen from the Du River, Liberia. He believed the short tail a diagnostic character but we now know that this is the result of accident, and is not uncommon among these dormice. Indeed, Thomas (Proc. Zool. Soc. London, 1905, p. 491) has shown that such broken tails may even undergo a partial cartilaginous regeneration of the terminal axis. At Paiata an adult female and her two small and much grayer young were brought to us by a native on October 11. In spite of much trapping we were unable to secure additional specimens.

Claviglis nagtglasii (Jentink). Nagtglas's Dormouse

Graphiurus nagtglasii Jentink, Notes Leyden Mus., vol. 10, p. 38, 1888: Gold Coast.

A larger species than the preceding with a longer hind foot, 30 mm. instead of 15; reddish brown, feet white, whitish below; tail distichous and full.

In 1862 a specimen of this larger species was sent to the Leyden Museum from the Gold Coast by Nagtglas after whom it is named. Jentink, in describing it, mentions additional specimens from the Du and the Farmington rivers, and Miller records one from Mount Coffee. No doubt this is the species included as *G. hueti* in Johnston's list of Liberian mammals, but that species, though perhaps nearly related, is Senegambian, and doubtless will be found to differ from this form of the rain-forest belt. The dormice of this genus are more or less arboreal, though often coming to the ground at the bases of trees.

MURIDAE Old World Rats and Mice

Rattus rattus rattus (Linné). Black Rat

Mus rattus Linné, Syst. Nat., ed. 10, vol. 1, p. 61, 1758: Sweden.

Size large, ears large, tail longer than head and body; above black, slightly more slaty below, feet sometimes white.

The European Black Rat has been introduced in Liberia and is occasional, but less abundant that the Gray Rat. Büttikofer secured specimens at Robertsport and Miller records four from Mount Coffee. We had several brought to us that were taken in native houses, but preserved only one, that came into one of our tents on the Du River. It had probably wandered along the path to our camp from the bungalow of the local superintendent of the plantation, a few hundred yards away, whose chicken house was much troubled by rats. This specimen is not as deep black as typical black rats, but a dull grayish, overlain above with abundant black hairs, and showing in a good light a faint tinge of brownish. Possibly the black individuals here interbreed with the gray, and the deep black coat seen in the Black Rat of New England becomes diluted, or these may be merely melanistic individuals of the next.

Rattus rattus alexandrinus (Geoffroy). Roof Rat

Mus alexandrinus Geoffroy, Cat. Mamm. Mus. d'Hist. Nat. Paris, 1803, p. 192: Alexandria, Egypt.

A rat with large ears, and tail longer than head and body, scaly; above dull brownish, due to a mixture of long black hairs with others having a subterminal yellowish tip and gray base; below soiled gray.

The introduced Gray or Roof Rat swarms about the native villages, where it lives chiefly in the thatched roofs of the houses by day, and at night ventures forth in search of food, so that we found it unsafe to leave any specimens exposed during the night lest they be eaten or carried off. The native houses are usually circular, with a high and steeply pitched roof of many poles, covered with a deep thatch of palm or other broader leaves. A rough ceiling of cross-poles forms a sort of attic space, sometimes used for storage, but usually in the "palaver kitchens" in which we camped, empty. This roof makes an excellent refuge for the rats. On one occasion a very young one dropped through the chinks of a roof on to our table below. Exactly how these rats have reached even remote villages separated from their neighbors by miles of forest is difficult to see unless they have been transported by persons carrying baggage or perhaps they follow along streams and paths to a certain extent. No doubt they often come into competition with the Multimammate Rats, for these too are house rats in this part of Africa, coming freely into the huts and "palaver kitchens" or public gathering houses. Thus at Gbanga, we were more than once disturbed at night by the scuffling and squealing of rats fighting on the floor near our beds, and although we did not identify the combatants, there is little doubt that they were these two species, for traps set about the inside of these houses caught the two kinds only. Büttikofer's *Mus rufinus* is probably this. At Paiata a small python was brought in, the stomach of which contained a Roof Rat.

Rattus norvegicus norvegicus (Erxleben). Norway Rat

Mus norvegicus Erxleben, Syst. Regni Anim., vol. 1, p. 381, 1777: Norway.

In color much like the Roof Rat, but ears small and tail about as long only as head and body, instead of longer. Introduced.

The Norway Rat is a more terrestrial species than the preceding, making burrows about buildings and along banks, while the Roof Rat is a climber, though both forage about a great deal on the ground. The Norway Rat, too, is in general more northern in its natural distribution and is usually much less common in warm countries than is the Roof Rat. Of the many rats we saw captured, all were of the latter type, but Büttikofer claims to have captured the Norway Rat at Robertport. It must be relatively uncommon, however. It is interesting that neither Büttikofer and his associates nor our party found any evidence of the introduction of the common House Mouse. It is likely that it may occasionally be found in the port of Monrovia but would perhaps become established with difficulty on account of coming into competition with the Multimammate Rats.

Cricetomys gambianus liberiae Osgood. Giant Rat

Cricetomys gambianus liberiae Osgood, Ann. Mag. Nat. Hist., ser. 8, vol. 5, p. 281, 1910: 50 miles inland from Monrovia, Liberia.

A giant species, two feet or more in length, the long tail with a white tip; general color above light chocolate brown, slightly mixed with black; below, shading into whitish or grayish white, feet silvery. Widely distributed in tropical Africa, with sundry local races.

We were unfortunate in failing to secure specimens of this large rat though apparently it is not uncommon. Büttikofer found it living in old termite hills whence it is often dug out by the natives. He records it from Bavia, Buluma, and the Junk, Du, and Farmington rivers. He adds that in captivity it soon becomes rather tame though always ready to bite, and will sit up on its haunches to eat, using its tail for a support like a miniature kangaroo. Like the latter it will sometimes leap forward on its hind feet alone. Miller records a single specimen from Mount Coffee. Osgood described this slightly differentiated local race from two specimens in the British Museum collected by A. Whyte fifty miles inland from Monrovia, and records a third from Sierra Leone.

Dephomys defua (Miller). Bristly Rat

Mus defua Miller, Proc. Washington Acad. Sci., vol. 2, p. 635, 1900: Mount Coffee, Liberia.

A medium-sized rat, head and body about 128 mm., tail 187, the tail bare except at the end where it is slightly hairy; color above ochraceous, darkened in the mid-line of back by numerous black hairs, many of which on the rump project noticeably beyond the rest of the pelage, and are conspicuous by reason of their shiny ochraceous tips; sides clearer ochraceous, feet the same; lower side whitish, the hairs gray at base and showing a buffy wash in the mid-ventral region.

This rat was first made known by Miller on the basis of a specimen obtained at Mount Coffee and Thomas later (1926) erected a special genus for it, pointing out that in its possession of numerous conspicuous bristly hairs on the rump it showed an approach to *Stochomys*, found farther to the east and south in the Cameroons. We secured two additional specimens, one on the Du, July 27, another at Betala, farther inland, on October 14. It is probably to some extent a climbing rat as indicated by the long tail, slightly hairy at the tip.

Thamnomys buntingi Thomas. White-bellied Bush Rat

Thamnomys buntingi Thomas, Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 381, 1911: Gouyou, Bassa, Liberia.

Externally similar to the last, but the belly clear white to the roots of the hairs, the hind feet with a dark central area, and the back duller, lacking the long shiny-tipped hairs; head and body about 108 mm., tail 170, hind foot 23, greatest length of skull about 29.

This is another climbing species, with long tail, and was first discovered by R. H. Bunting in Liberia in 1911. From other members of the genus it is distinguished by its size, the short palatal foramina, the small bullae and teeth. We secured two specimens only, one at Gbanga, the other at Paiata. No doubt, like others of the genus, they are to a certain extent at least, arboreal, and it was probably an individual of this or the preceding species that one of us saw in mid-afternoon climbing quickly along the branches of a bushy thicket, disappearing from view before it could be secured.

Mastomys coucha erythroleucus (Temminck). Multimammate Rat

Mus erythroleucus Temminck, Esquisses Zool. sur la Côte de Guiné, 1853, p. 160: Guinea.

A small rat with tail usually slightly shorter than head and body; general color above grayish in immature animals, becoming slightly brownish in fully adult individuals; feet white; lower side grayish.

The Liberian representative of this widespread species is doubtless the same as the *Mus erythroleucus* named by Temminck from the Guinea Coast, and this in turn is probably not very different from the race of Central Africa. It was perhaps a young one of this rat that Jentink records as possibly "*Mus nigricauda*" in his report on Büttikofer's collections. Thomas has erected for these Multimammate Rats a special genus, *Mastomys*, in which there are twelve pairs of mammae arranged in two rows from axilla to groin. We opened a number of females to see what correlation there might be between the number of young and the large number of mammae, but in no case found so many as twenty-four embryos. One from Gbanga, September 20, contained eight, five on one side and three on the other; a second, September 24, contained fifteen; Hollister records that in East Africa, Heller found ten, twelve, and thirteen, in specimens taken. The Multimammate Rats are the commonest of the native species in Liberia, especially abounding in the vicinity of villages and clearings, and doing more or less damage in the rice fields by cutting down the stalks of grain. They come freely into the houses and seem to meet with some competition from the introduced House Rats, for we several times woke at night to hear lively fighting going on among rats near our cots, and our traps set inside the shelter would catch both species. We even got Multimammate Rats in our tents pitched in an area on the Du River only recently cleared of forest and at some distance from the nearest village. At Gbanga where both species were foraging nightly in our "palaver kitchen," it was noticeable that a majority of those caught showed small wounds on the tail as if they had been bitten in fighting. Snakes doubtless get a good many, for in a green viper and in a Gaboon viper brought in, we found a rat of this species. Apparently they avoid the forest.

Praomys tullbergi rostratus (Miller). Short-haired Ground Rat

Mus tullbergi rostratus Miller, Proc. Washington Acad. Sci., vol. 2, p. 637, 1900: Mount Coffee, Liberia.

In size and general appearance resembling the last, total length about 277 mm., tail 144, foot 26; but fur fine in texture, soft and rather short, lacking the conspicuous longer guard hairs; young are gray above and paler gray below, but adults become dull ochraceous above, clearer on the sides; below whitish, the hairs with conspicuous gray bases; tail naked.

The dense even texture of the fur is characteristic, and the foot is elongate like that of ground-living mammals, in contrast with the next genus, in which it is shortened for climbing. Thomas has pointed out other matters of difference in the number of roots in the molars and regards the species as representing a distinct genus (Ann. Mag. Nat. Hist., ser. 9, vol. 17, p. 178, 1926). Miller separated this form of the West African forest area from the typical race of the Cameroons chiefly on the basis of cranial characters, the skull having a heavier rostrum and mandible. His specimens, nine in all, were from Mount Coffee and we obtained others on the Du River, and at Gbanga and Paiata. An adult female had 1–2 = 6 mammae.

Hylomyscus alleni simus, new subspecies. Short-haired Bush Mouse

Type, adult male, skin and skull, No. 24028, Museum of Comparative Zoology, from Merikay, interior of Liberia, September 13, 1926. G. M. Allen and H. J. Coolidge, Jr., collectors.

Description. — Similar to *H. a. stella* of the Cameroons, but with much shorter rostrum and smaller teeth; the backs of the feet are dark brownish or dusky instead of dull whitish.

Fur very fine, soft, and close; dorsal surface of head, body, and limbs dark ochraceous tawny, brighter, nearly cinnamon or tawny on crown, cheeks and shoulders; backs of hind feet ochraceous tawny, tips of toes whitish; ears and tail nearly naked, dull brown with minute scattered hairs; lower surface of body and limbs gray, the hairs with dull gray bases and minute whitish tips.

Skull. — The skull, compared with that of *H. a. stella* from the Cameroons, differs chiefly in its obviously shortened rostrum and smaller teeth. The supraorbital edge is sharp, forming a short beading, though according to Thomas this is not so pronounced in *stella* as it is in *H. aeta*, a second Cameroon species, which apparently does not reach Liberia. Thomas has also pointed out that the mice of this group are distinguished from *Praomys* by the presence of but one internal and two external roots to the first upper molar. The rostrum of *simus* measured from the anterior base of the zygomatic plate to the tip of the nasals is about 1.5 mm. shorter than in *stella* (6.4 instead of 7.8 mm.), and the tooth row is only 3.8 instead of 4.3 mm.

Measurements. — The type measured in the flesh: total length 231 mm., tail 137, hind foot 19, ear from meatus 16.

Skull: greatest length 24 mm., basal length 21, palatal length 11.5, diastema 6.5, nasals 8, orbit to tip of nasals 7.7, anterior base of zygomatic plate to tip of nasals 6.4, zygomatic width 12.4, width of braincase 11.4, across anterior molars 4.7, upper tooth row 3.8, lower tooth row 4.

The short but broadly spread hind foot of these handsome mice is correlated with climbing habits. While we were stopping at the little village of Merikay ("America"), three specimens, a pair of adults and an immature, were brought to us, caught by a native apparently in the thatch of his hut. A Cameroons specimen was secured by Bates in a similar situation. At Paiata we obtained another adult. The young one is dark drab, with a wash of ochraceous. The typical race, *H. alleni alleni* Waterhouse, of the Island of Fernando Po, according to Thomas, is very much like *stella* but differs in slight cranial characters. Since the race here described is apparently the Liberian representative of the same species, we have used the trinomial for it. At first sight, this short-furred russet mouse is very similar to *Praomys t. rostratus*, but the small, broad foot and more delicate form at once distinguish it externally. The two genera, as Thomas suggests, are doubtless closely related, but *Hylomyscus* is an arboreal modification, while *Praomys* may be a ground-living offshoot of a similar common stock. An adult female has mammae 2–2 = 8. Ours is apparently the first record of the genus from the West Coast forest area.

Dasymys rufulus Miller. Swamp Rat

Dasymys rufulus Miller, Proc. Washington Acad. Sci., vol. 2, p. 639, 1900: Mount Coffee, Liberia.

A medium-sized, shaggy-haired rat, total length about 300 mm., tail about 150; general color above wood brown, darkened on dorsal area by black hairs with a slight iridescence; sides paler; belly grayish white, slightly washed with buffy, the dark gray bases of the hairs showing through; tail with numerous fine hairs about the length of two scales; feet dull gray, the minute hairs shiny.

At first glimpse this resembles the common Norway Rat, and it may have been that Jentink's inclusion of this species in the list of Liberian mammals was a misidentification of a swamp rat. The latter is of about the same size and proportions as a small Norway Rat, but is somewhat more shaggy, the ears and tail hairier, while the smaller skull is characteristic. Miller described the species on the basis of six specimens from Mount Coffee, Liberia, and we secured an adult male on the Du River, but did not meet with it elsewhere. It is supposed to be swamp-living. No doubt this form will eventually prove to be merely a subspecies of some well-known and widely ranging species.

Leggada musculoides (Temminck). Harvest Mouse

Mus musculoides Temminck, Esquises Zool. sur la Côte de Guiné, 1853, p. 161: Guinea Coast.

A small mouse, shorter-tailed than the House Mouse; above mixed tawny and black, resulting in yellowish-gray effect, slightly darker in the mid-line of the back; below white to the roots of the hairs; length about 135 mm., tail 50, foot 16; mammae 3–2 = 10.

The little Harvest Mouse is readily distinguished from the House Mouse by its shorter tail and pure white belly. It seems to be a common species in open places, among roots of bushes, grass clumps, or in the rice fields, where it no doubt eats a certain amount of grain. We caught a number near a cluster of native huts on the edge of a grassy clearing on the Du, and again in the vicinity of Gbanga it was common in drier places among weeds and in the fields. One taken at the latter locality on September 23 contained five embryos. There seem to be no obvious differences between these specimens and others from the Cameroons. Büttikofer, who secured specimens at Grand Cape Mount and on the Junk and Du rivers, says that they make nests of grass as big as one's fist, slightly above the ground, woven into the surrounding twigs and grass stalks. Those we caught were taken among the standing rice or at the entrances to cavities among roots of bushes at the edges of clearings. Miller records two of this species from Mount Coffee.

Lemniscomys striatus striatus (Linné). Striped Grass Mouse

Mus striatus Linné, Syst. Nat., ed. 10, vol. 1, p. 62, 1758: type locality restricted by Thomas to Sierra Leone.

Size medium, total length about 243 mm., tail 134; a black line from head to base of tail, and on each side about six longitudinal broken lines of oblong spots whitish in color, the dorsal rows slightly buffy; head and spaces between the white lines brownish, slightly grizzled with gray; belly creamy white.

This is a widespread species in Africa, of which numerous local races are recognized, yet the West African form is remarkably like those from East Africa. The very short fifth hind toe with a nail instead of a claw is one of the obvious external characters of the genus. This mouse seems to be not uncommon about the edges of clearings and the borders of the rice fields, but apparently avoids forest country. We secured a few specimens on the Du River and at Paiata and Gbanga; Büttikofer obtained it on the Junk River and from Cape Mount, while Miller records it from Mount Coffee.

Hybomys univittatus planifrons (Miller). Striped-back Mouse

Arvicanthis planifrons Miller, Proc. Washington Acad. Sci., vol. 2, p. 641, 1900: Mount Coffee, Liberia.

Size about as in the preceding species, but tail slightly shorter in proportion; a black stripe down the back from forehead to root of tail; upper parts of body elsewhere a uniform mixture of ochraceous and black, palest on cheeks, becoming richer and more rufous posteriorly; tail with minute black hairs; lower surface of body and limbs pale ochraceous.

This is evidently the West African representative of the more eastern Cameroons species, *H. univittatus*. Miller has pointed out that the Liberian animal differs noticeably in the less bowed profile of the skull, a character that is borne out by the small series of additional specimens that we secured on the Du River. The coloring also seems much more intense than in the Cameroons animal, which has a nearly grayish belly, lacking the rich ochraceous suffusion. We were unable to trap any of these, but the natives who brought in the few that we preserved, said they were forest-living. In addition to the two from Mount Coffee recorded by Miller, one was secured by Büttikofer at Hill Town.

Hybomys trivirgatus (Temminck). Three-striped Mouse

Mus trivirgatus Temminck, Esquisses Zool. sur la Côte de Guiné, p. 159, 1853: Dabacrom, Gold Coast.

Similar to the last but the ground color less rufous, more ochraceous, the back with a median black stripe from forehead to root of tail and a second stripe on each side from the shoulder to rump, slightly less marked; below grayish white with a faint buffy wash.

This mouse proves to belong to *Hybomys*, although on account of the more specialized teeth Thomas made it the type of the genus *Typomys*. The middle cusp of the upper molars is more beak-like, directed backward, with connecting ridges between the laminae. Büttikofer obtained a specimen at Grand Cape

Mount where he was told it was not rare, living in the forest and hiding under piles of rubbish. It was collected also by Bunting, presumably near Bassa, Liberia, in November 1910 (Thomas, Ann. Mag. Nat. Hist., ser. 8, vol. 7, p. 382, 1911). We preserved two young about a third grown, that were brought to us at Banga and Paiata, in October.

Lophuromys sikapusi (Temminck). Red-bellied Mouse

Mus sikapusi Temminck, Esquisses Zool. sur la Côte de Guiné, p. 160, 1853: Dabacrom, Gold Coast.

About the size and proportions of a meadow mouse (*Microtus*); total length 197 mm., tail 69, foot 23; above olive brown, the hairs orange buff at base, this color showing through on the sides and grading into clear ochraceous with a tinge of pink on the lower surfaces; tail dark all around, backs of feet dull ochraceous. Sierra Leone to Cameroons and Congo.

This short-tailed rat is easily distinguished by its proportions and the peculiar orange buff of the lower side. We secured specimens at Gbanga and Paiata, and Büttikofer records it from Buluma, Robertport, and stations on the Junk and the Du rivers. He says it is found about habitations as well as in the bush growth. Our experience was limited but we found it on the edges of rice fields or among rank weeds. To a certain extent it represents *Microtus* in its habitat preference, though probably preferring drier situations.

Malacomys edwardsi Rochebrune. Big-eared Rat

Malacomys edwardsi Rochebrune, Bull. Soc. Philom. de France, Paris, vol. 9, p. 87, 1885: Mellacori River, French Guinea.

A medium-sized, slender rat, with large ears and long hind feet; brownish above, ochraceous on sides; gray below.

This West Coast form of the genus was first described by Rochebrune from French Guinea, near the Sierra Leone border, but it is still uncertain how closely it may be related to *M. longipes* of the Cameroons. Miller recorded a young individual from Mount Coffee and Thomas mentions that one was taken by R. H. Bunting in 1910 at Bassa, Liberia.

CTENODACTYLIDAE

Thryonomys swinderianus swinderianus Temminck. Cane Rat; "Ground-hog"

Aulacodus swinderianus Temminck, Monogr. de Mammal., vol. 1, p. 245, 1827: probably West Africa.

A stoutly built, chunky animal, about the size of a small ground-hog; upper incisors with two grooves, molars with one inner and two outer folds of enamel; coarse-haired, drabby brown. Gambia to Nigeria.

The local name "Ground-hog" is unusually apt, for in its stout build and general habits it recalls our Woodchuck and seems to occupy a somewhat corresponding niche, which perhaps accounts for its persistence as an archaic member of the African fauna, belonging to a group of rodents now very poorly represented in the Old World. It is said, however, not to live in burrows, but instead makes forms on the surface of the ground, among rank grass and weeds. Although this

No. 446. — Zoological tray, rodents, Gbanga, Liberia

No. 447. — Long-tailed Manis, *Uromanis longicaudatus* (Brisson)

animal was reported to us at one of the Firestone plantations on the Du River, we were not fortunate enough to see or obtain specimens. Büttikofer states that he could find no sign of its presence in the Cape Mount Region, nor on the Junk and its tributaries, and it seems to avoid altogether the forested regions. He found it locally common, however, on the lower St. Paul's River, where it did a certain amount of damage among cassava, rice, and maize fields. The natives catch them in dead-falls. The original specimen on which the name is based, was a young one without locality, the skeleton of which was preserved in the Muséum des Pays-Bas.

HYSTRICIDAE Old World Porcupines

Atherura africana africana Gray. Brush-tailed Porcupine

Atherura africana Gray, Ann. Nat. Hist., vol. 10, p. 261, 1842: Sierra Leone.

Size of a ground-hog, the body provided with numerous stout grooved dark-brown spines, the tail bearing a tuft of capsulate hairs that resemble oats and make a rustling sound when shaken. West African Coast region.

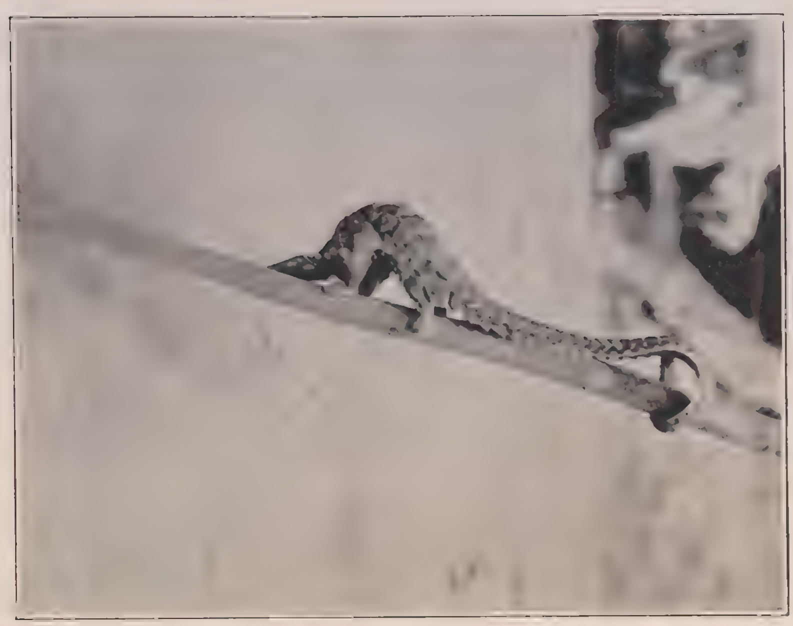
The Brush-tailed Porcupine of Africa was originally described from Sierra Leone, so that the specimen we brought back from Paiata is to be considered typical. Thomas has shown that the representative form of Central Africa has a narrower rostrum and brain case, less inflated frontal region and smaller teeth. He gave it the name *centralis* (type locality Monbottu). Specimens from the Cameroons seem to be the same, so that again we have a case where the West Coast forest region maintains a well-differentiated subspecies. This is probably not uncommon in the forest but is seldom seen. Büttikofer secured it at Grand Cape Mount, as well as on the Junk River, and says that old termite hills are favorite retreats. It also makes burrows among the roots of large trees or among rocks, one such that he found having six entrances. On the Du River the tail of one was brought to us that had been roused by men at work clearing the forest.

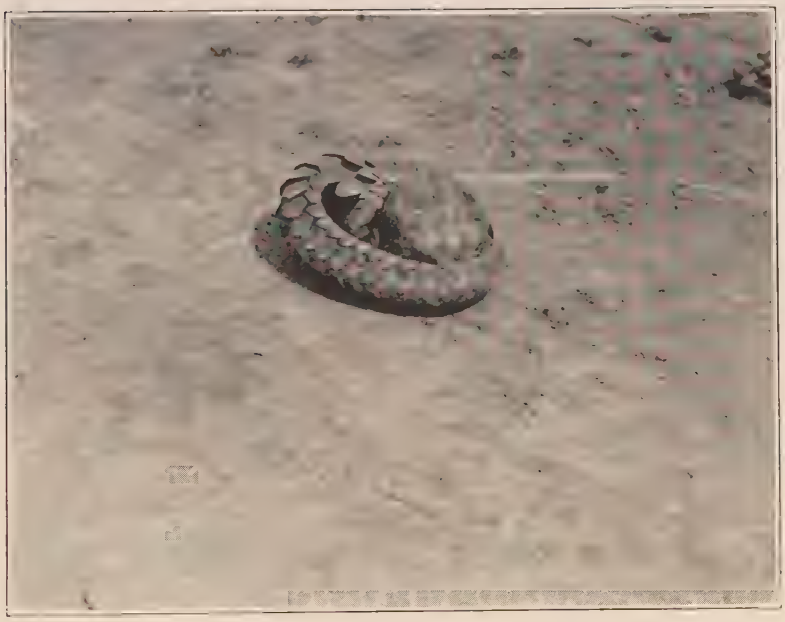
Hystrix cristata senegalica F. Cuvier. Crested Porcupine

Hystrix senegalica F. Cuvier, Mém. Mus. d'Hist. Nat., Paris, vol. 9, p. 430, 1822: Senegal.

A larger, stoutly-built species with very short tail and very long black-and-white banded quills, some thick and stout, others slender. Anterior part of the skull much inflated. West Africa.

We can add nothing concerning this species, which seems to be uncommon, for we did not even discover its burrows. Büttikofer, however, notes specimens from Robertport and the Junk River. The relationship of this to the other forms of *Hystrix* described from Africa is still uncertain. If it really differs from typical *cristata* or if the Liberian form is different from that of Senegal, to which Cuvier's name applies, are still somewhat uncertain. The type consisted of only the teeth and part of the skull of a very young one, so that a further characterization of the animal would be desirable.





Nos. 448, 449. — Long-tailed Manis, *Uromanis longicaudatus* (Brisson)

EDENTATA

MANIDAE Scaly Anteaters

Phataginus tricuspis (Rafinesque). Pointed-scaled Pangolin

Manis tricuspis Rafinesque, Ann. Sci. Phys. Bruxelles, vol. 7, p. 214, 1821: West Africa.

A long-tailed pangolin in which the scales are small, numerous, and with the end of each more or less three-pointed. West Africa.

A native-made skin bought at Sinoe was the only one we secured. Büttikofer, however, and his associates procured others at Buluma, Schieffelinsville, Hill Town, and on the Farmington River, so no doubt it is generally distributed over the forested region. Indeed, Büttikofer says it is often kept alive in the native houses, and allowed to run freely for it feeds on ants and noxious insects and so is highly beneficial in a country so plagued with ants. It is a ready climber and at least in part of arboreal habits.

Uromanis longicaudatus (Brisson). Long-tailed Manis

Pholidotus longicaudatus Brisson, Regnum Animale, p. 19, 1762: (probably West Africa).

Tail very long, scales blackish and orange yellow, those at the shoulders much enlarged. West Africa.

Pocock has recently reviewed the pangolins and regards the longer-tailed species as generically distinct from the others. A pangolin of this species was brought to us alive at Lenga Town on the Farmington River and was kept alive for a few days. At first it was very shy, remaining curled up most of the day, with its long tail wrapped tightly over the body like a watch-spring. It later relaxed, but would resume its coiled condition on the slightest alarm, and such was its strength that considerable force was necessary to uncoil its tail a little. After a few days it would uncoil and stand in its cage on all fours or sit erect using its tail as a third leg of a tripod. Another one we had brought in at Paiata was tied by its tail to a rafter of our hut, but escaped during the night. Büttikofer secured specimens from Soforé Place, Hill Town, and the vicinity of Farmington River. He says it is an active and rapid climber, and is often found rolled up as if asleep in the forks or hollows of trees. One he kept alive at the first-named place was fed on termites from the peculiar mushroom-like nests found in the forest. It would climb to the roof and search there for house termites as well.

Smutsia gigantea (Illiger). Giant Scaly Anteater or Pangolin

Manis gigantea Illiger, Abh. Akad. Wiss. Berlin, p. 84, 1815.

Size very large, tail about as long as body.

Pocock regards this and the smaller Temminck's Pangolin of South and East Africa as constituting a genus distinct from the arboreal pangolins of Africa. It is large, as shown by the following measurements of a record male which we obtained from the natives at Paiata: total length 1710 mm., tail 830, tongue about 370. This species is terrestrial, and lives in large holes. Büttikofer regarded it as rare, and says that only driver ants and termites were found in the stomach of one from Cape Mount, while that of a second, from Little Bassa, contained nothing but a ball of grass as big as one's fist, according to Stampfli, the collector.

ARTIODACTYLA Even-toed Hoofed Mammals

SUIDAE Pigs

Koiropotamus porcus (Linné). Red River Pig

Sus porcus Linné, Syst. Nat., ed. 10, vol. 1, p. 50, 1758: Africa, Guinea.

A reddish orange color, with a white line down the back; forehead blackish; ears with a long tuft of hair. West Africa.

Although apparently of general distribution, this pig is seldom seen. Büttikofer secured three specimens on the Junk, the Du, and the Cess rivers, and says that they may lie half the day in a wallow in the mud and not be noticed. Or the sow with her eight to twelve young may lie in a place scooped out in a grassy field, with noses to the center, sleeping while the boar keeps watch. They feed on roots, fruits, and palm nuts. A native hunter, Taylor, assured us that in June and July this pig builds a sort of nest, a pile of brush three or four feet thick with a little clearing all around it, and crawls in under it to bring forth her ten to twelve young. One such nest he showed to one of us, and pointed out a long vine that stretched under the nest and across the opening around it, useful, he said, as a means of warning the pig of danger in case the vine is stepped on. He claimed that he had startled the old pig in that way more than once. According to this same informant, there are two sorts of wild pigs, red and black, the latter much more dangerous to hunt. They do not see very well, and are hunted by tracking them and coming on them as they feed. Johnston has suggested the possibility of the Forest Pig (*Hylochoerus*) occurring in Liberia, but no specimens seem to have been taken. Whether the black pigs so often reported may be of this type remains to be proved.

Choeropsis liberiensis (Morton). Pygmy Hippopotamus

Hippopotamus liberiensis Morton, Journ. Acad. Nat. Sci., Philadelphia, ser. 2, vol. 1, p. 232, 1849: St. Paul's River, Liberia.

The Pygmy Hippopotamus is a smaller edition of the more familiar species of the East and South African rivers, but has usually only one pair of incisors in the lower jaw, and the feet have the toes slightly more separate and spreading. In addition the proportions of the head are quite different.

It is remarkable that this species should be confined to the rivers and forests of Liberia and the adjacent borders of Sierra Leone, whence a number of specimens have been secured from time to time. The British Museum has a skin and skull from Moa Valley, Daru, Sierra Leone, and a second from the Liberian border of that country. Liberian specimens have been on exhibition at the Zoological Gardens, London, in 1913, and we saw two there in 1926. We were unsuccessful in our efforts to come upon this species, though on one occasion a young one was startled on the bank of the Du, and was said to have plunged into the stream. Shortly before our visit, the launch of the Firestone Company was said to have been attacked by a hippo while proceeding up the stream. The animal came up under the bow but did no harm, though nearly oversetting the boat. Apparently the first living specimens to reach this country, were a pair secured by Hans Schomburgk for Hagenbeck, in 1911–12 and purchased by the New York Zoölogical Society; and in the spring of 1927 the capture of a young one and the shooting of the mother were reported on the Du. The young one was sent to the Zoological Park at Washington. Both Büttikofer and Schomburgk agree that it is less a frequenter of the riverways than of the forest and swamps. It is solitary, but may be taken in pitfalls made along the forest trails. Büttikofer's specimens were from Buluma, Hill Town, and Jeh on the Du River, while another was seen on the St. John's River. According to Hornaday, the adult male secured for the New York Zoölogical Society stood thirty inches high at the shoulders and weighed four hundred nineteen pounds. Jentink points out the variation in the number of lower incisors in the skulls secured by Büttikofer: there were three on each side in one, two on one side and one on the other in a second, and three on one side and one on the other in a third. Reference may be made here to various accounts of the structure of the Pygmy Hippo, including the original articles by Morton (1844, 1849), the study of the skeleton by Milne-Edwards (1868–1874), notes by Chapman (1893), as well as to Hornaday's (1912) note on the pair in the New York Zoölogical Gardens and Schomburgk's (1912) account of their capture, while Pocock's (1913) article on the one in the London Zoological Gardens gives additional valuable details and suggests the former wide range of the Pygmy Hippos, since the superficial deposits in the island of Madagascar contain skulls of this type.

TRAGULIDAE Chevrotains

Dorcatherium aquaticum aquaticum (Ogilby). Water Deer; Chevrotain

Moschus aquaticus Ogilby, Proc. Zool. Soc. London, 1840, p. 35: Sierra Leone.

Small, standing about 12 inches at the shoulder, the males with enlarged upper canines; ground color rich dark brown mixed with black, above; two broad white lines on sides of throat, the upper one nearly continuous with a lengthwise stripe from neck to rump along the sides, with an indistinct one below it on trunk, and a line of white spots above it beginning at shoulders; about five transverse rows of white spots on back; chest white. Gambia to Congo.

The chevrotains retain a complete metapodial for each of the small lateral toes of the feet, and there is a curious callosity at the heel. This species is well known to the Liberians, but we saw nothing of it. Büttikofer says it is common on the Junk, Du, and Farmington rivers, whence he secured specimens as well as at Bendo, but he was unable to obtain it at Robertport, though the natives were well acquainted with it there. More recently, however, a body skin was secured at Mt. Barclay by R. H. Bunting for the British Museum. Johnston has given a good account of its appearance, and publishes a photograph of a living one sent to the Zoological Society's Gardens at London, from central

Liberia. Its extraordinary manner of standing on tiptoe, so that the lateral toes do not come near the ground is well shown. Büttikofer remarks that although it is said to eat fish (probably an inference from its aquatic habits), he found only grass in the stomach. We were told that the natives hunt them with dogs in May and June when the streams are lowest.

BOVIDAE Antelopes, Cattle, Sheep

Neotragus pygmaeus (Linné). Pygmy Antelope; "Jack"

Capra pygmaea Linné, Syst. Nat., ed. 10, vol. 1, p. 69, 1758: Guinea.

Small, total length about 580 mm., tail 75, height at shoulder 300 (about 12 inches); body, limbs, sides of neck, and throat bright orange rufous, the head, ears, neck, and fore shoulders dull brown; belly and under side of tail white. Sierra Leone to southern Nigeria.

This is the *Cephalophus spinigera* of Büttikofer's Reisebilder, but he apparently did not secure specimens. In the Liberian folklore it takes the place of "Br'er Rabbit" for quickness and sagacity. We had several specimens brought in to us at Gbanga, and Merikay, a few miles away. At the latter place we participated in a hunt for these small antelopes, in which the whole village entered. Several men assembled in the forenoon, after the game is supposed to be lying up for the heat of the day. Each man had a large net with a mesh of several inches somewhat like a tennis net, but about six feet high. Accompanied by beaters and men with bows and arrows, we all set forth for an area of dense swampy thickets, where along certain well-known trails, the nets were erected along a line of several hundred feet, net joined to net. The bowmen were stationed behind the nets and when all was ready the beaters spread out in line at some distance away, and advanced toward the nets shouting and crashing through the jungle. Any antelopes that happen to be within the area covered, are driven toward the net and entangled in it or shot before they can escape. When the first area is covered, the nets are moved on to a second, until the various plots of thicket have been hunted out. Although we had little luck, one or two antelopes were started but escaped by doubling back through the none too enthusiastic beaters. A day or two later the men tried again and brought us a couple of specimens. On September 22, at Gbanga, a very small young one (No. 450, p. 611), hardly able to stand, was brought to us that had been captured in the forest near, while on the following day the hunters at Merikay captured an adult female containing a large foetus. The mammae in this species are four, inguinal.

Cephalophus sylvicultrix (Afzelius). Yellow-backed Duiker

Antilope sylvicultrix Afzelius, Nova Acta Soc. Upsala, vol. 7, p. 265, pl. 8, 1815: Sierra Leone.

Largest of the genus, about the size of a large goat but stockier; general color black, with a broad yellowish band on the lower half of spine; a tuft of coarse hair at the occiput chestnut; horns short and stout, about 4 inches long. Sierra Leone to Fanti.

This is the largest of this genus of stockily-built bush antelopes, of which no less than seven species are known from Liberia. All are dwellers in thickets and forests, scurrying to shelter at the least alarm. Of the Yellow-backed Duiker there seems to be very little information from Liberia. According to Büttikofer, his native hunter, Jackson, told him that it was rare on the Marfa River near the Sierra Leone border but more common on the Manna and Solyman rivers. He adds that it occurs also on the Junk River, whence Schweitzer secured a specimen that was sent to the Berlin Museum. The British Museum has a specimen from Sierra Leone.

Cephalophus jentinki Thomas. Jentink's Duiker

Antilope longiceps Jentink, Notes Leyden Mus., vol. 7, p. 272, pl. 10, 1885, not of Gray.
Cephalophus jentinki Thomas, Proc. Zool. Soc. London, 1893, p. 417: Liberia.

Slightly smaller than the preceding, 30 inches high at the shoulder; head, neck, and chest-stripe black, a whitish collar on shoulders and chest; body dark gray. Liberia.

The type of this handsome antelope is a mounted specimen in the British Museum, obtained by Büttikofer in Liberia. The species was first described by Jentink on the basis of a female secured by the same collector, but unfortunately the name was preoccupied for another antelope so that Thomas redescribed it under the name given above. Büttikofer and Stampfli secured their specimens on the Farmington River and at Schieffelinsville, as the former writes, in an area of elevated ground in the triangle between the Junk, Du, and Farmington rivers, surrounded by swamps. They are therefore hunted in the rainy season when canoes can be put through the swamp at high water. Apparently no other collectors have taken specimens, and the range is probably very limited.

Cephalophus dorsalis Gray. Black-backed Duiker

Cephalophus dorsalis Gray, Ann. Mag. Nat. Hist., ser. 1, vol. 18, p. 165, 1846: Sierra Leone.

A smaller species, about 16 inches high at the shoulder; general color rufous with a dark dorsal stripe which may be clear black or ill defined; a rufous or black crest at the occiput. Gambia and Sierra Leone to Gold Coast.

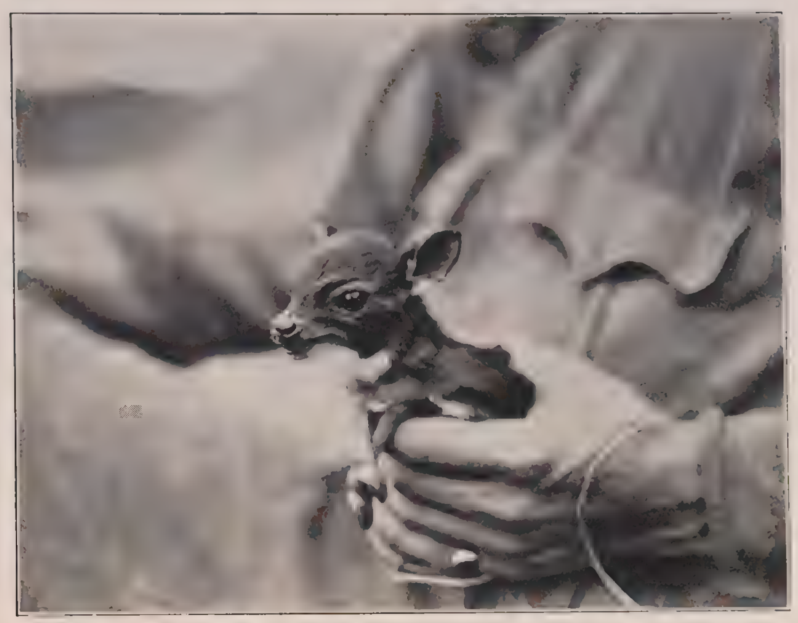
This is one of the commoner species of duiker in Liberia. We brought back specimens from Gbanga that were shot by a native hunter who volunteered his services. Büttikofer mentions others from the Junk and Du rivers (Schieffelinsville). At Monrovia one of the white residents had two which he kept as pets in his house. They had free run of the house and seemed to make most agreeable captives.

Cephalophus ogilbyi brookei Thomas. Brooke's Duiker

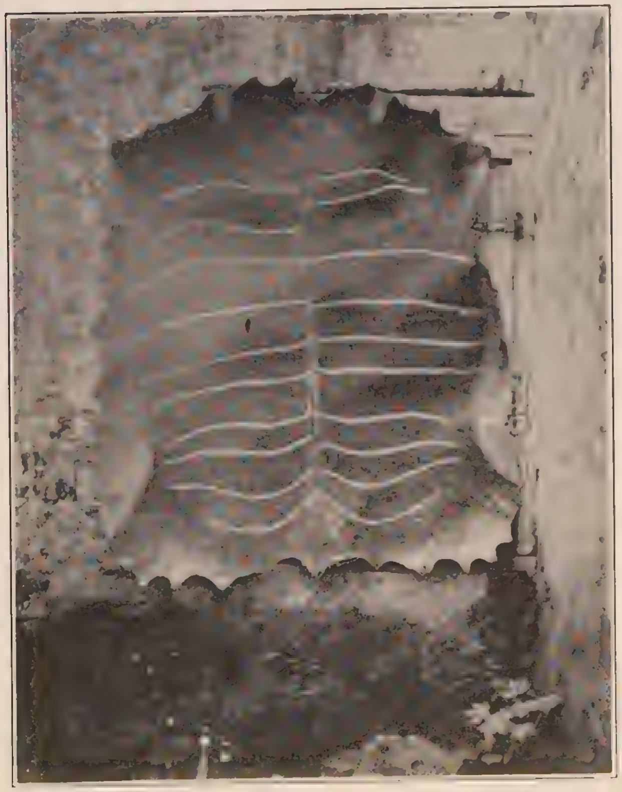
Cephalophus brookei Thomas, Ann. Mag. Nat. Hist., ser. 7, vol. 11, p. 290, 1893: Fanti.

Color bright orange to rufous on hind quarters; nose, nape and neck brown or blackish; a narrow black dorsal stripe from withers to tail. Nigeria to Gold Coast, and Liberia.

Büttikofer and Stampfli secured two specimens on the Du River which are included under the name *Cephalophus ogilbyi* in Jentink's report on the mammals of Liberia. The species is typical in Fernando Po, however, and Thomas has named the mainland representative of Fanti *C. brookei,* which may be regarded as of subspecific rank. It has a broader dorsal stripe, and a shorter black tail-



No. 450. — Pygmy antelope, *Neotragus pygmaeus* (Linné)



No. 451. — *Tragelaphus scriptus scriptus*

tuft than the island race, and the hairs of the nape are reversed. If the original identification is correct, the two specimens mentioned are more likely referable to the Fanti race.

Cephalophus doria (Ogilby). Zebra Antelope; "Mountain Deer"

Antilope doria Ogilby, Proc. Zool. Soc. London, 1836, p. 121: Sierra Leone.

A small species, standing 16 inches high at the shoulder; horns short and stubby; color pale rufous, with about thirteen black cross-bands on the body, from withers to rump. Liberia and Sierra Leone.

This remarkably colored antelope was first described from an imperfect skin in Gould's collection and another from Sierra Leone. No others had reached Europe until Büttikofer rediscovered the species in Liberia where it is known to the "Americo-Liberians" as Mountain Deer. He says it is found in hilly country back from the coast, and he secured specimens at Soforé Place and on the Du and Farmington rivers. It was apparently unknown in the region about Buluma and Cape Mount, though on his last visit to the country he had a piece of the meat with skin on it from Carpenter's Settlement. We saw nothing of it in life, but secured a native-dressed skin without head in the Kulu country and picked up a cranium in dense forest on the St. Paul's River near Kolobanu. The skull is peculiar in that the short stubby horns are set in a shallow recess in the frontal bone instead of projecting from a plane surface. Jentink notes the unusual development of "heel brushes" or tufts of stiff hair on the foot. The excavation for the lachrymal gland on the side of the rostrum is much shallower than in the other species of the genus, while the vomer is peculiar in that it extends quite to the posterior end of the palate dividing the narial chamber completely, instead of sloping forward as in the usual type. The shape of the posterior border of the palate is also different, nearly horseshoe-shaped instead of narrowly V-shaped. These differences fully justify the erection of a separate subgenus, *Cephalophula*, for this species, as Knottnerus-Meyer has done. The seemingly very restricted range of the species gives it additional interest as one of the characteristic mammals of the northwestern extension of the West Coast rain forest.

Cephalophus niger Gray. Black Duiker; "Bush Goat"

Cephalophus niger Gray, Ann. Mag. Nat. Hist., ser. 1, vol. 18, p. 165, 1846: "Guinea."

A medium-sized species, standing 18 inches at the shoulder; dark smoky brown or blackish all over, the face tawny; a tuft of stiff hair at the occiput rufous; ears rufous inside, the tail black with a whitish tip; horns up to 3.5 inches long in the male, smaller in the female. Sierra Leone to Ashanti.

The Black Duiker is locally known as "Bush Goat" and seems to be one of the commoner species of the genus, generally distributed in the forest area. Büttikofer and his associates secured specimens at Schieffelinsville on the Junk River, and at localities on the Du, Farmington, and St. Paul's rivers. The British Museum has two from Monrovia. A native hunter in our employ at Gbanga, brought in two adult females which he evidently had shot at very close range, probably by waiting for them at favorite places. The measurements of the larger are: total length 1050 mm., tail 100, hind foot 250, ear 87, height at shoulder 520.

Cephalophus maxwelli liberiensis Hinton. Gray Duiker; "Gazelle"

Cephalophus liberiensis Hinton, Ann. Mag. Nat. Hist., ser. 6, vol. 9, p. 530, 1920: Mount Barclay, Liberia.

Size medium, standing 14 inches high at the shoulder; general color slaty brown, paler below; horns small, the female hornless. Liberia to Gold Coast, and perhaps Nigeria.

Hinton has lately separated the form of Maxwell's Duiker occurring from Liberia south, from that found from Sierra Leone to the Gambia, on the ground that the horns are smaller and present only in the males, while those to the northwest have larger horns in the males, and the female is provided with these structures as well. Lydekker retains the generic name Guevei for this species.

This is probably the commonest of the genus in the thickets and forest undergrowth of Liberia. Büttikofer regarded it as the most plentiful of the duikers, and secured specimens from Soforé Place, Buluma, Robertport, and on the Junk, Du, and Farmington rivers. Near our camp on the Du, we frequently saw fresh tracks of small duikers in soft ground along the edges of bushy thickets or on the forest trails. One that we came upon just at daybreak, was standing among low growth at one side of the forest path, watching us intently, but on the instant that it was discovered and before a shotgun could be swung into position it had scurried away into the thicket. Büttikofer says that the natives trap them in foot or neck snares along trails, or shoot them from ambush in a tree or from the top of a termite hill. We occasionally came upon places in the forest where a duiker had come regularly for many days to deposit droppings, until a considerable pile had accumulated, some old and disintegrated, others fresher, still others very fresh indeed. This habit is probably not uncommon among small antelopes of various species that live in a circumscribed area. In spite of considerable hunting we saw almost nothing of the various duikers, probably because they are largely nocturnal or crepuscular in their activities, and because they keep in the shelter of dense thickets in the forest or the edges of clearings. Other species may occur within the limits of Liberia, such as *Cephalophus grimmia campbelliae*, known from Sierra Leone, orange yellow, profusely dark grizzled, seventeen inches at the shoulder.

Tragelaphus scriptus scriptus (Pallas). Bushbuck, Harnessed Antelope; "Red Deer"

Antilope scripta Pallas, Miscellanea Zool., p. 8, 1766: Senegal.

Larger, standing about 27 inches at shoulder; males provided with horns with a spiral twist; colors contrasting, the shoulder, haunches, belly, and a line down the back, black; head short-haired, pale rufous, the nape nearly bare; dorsal area bright yellowish rufous, becoming brighter and clearer rufous on the rump; about seven transverse white stripes, and a lengthwise one along the sides bordering the black belly; several white spots posteriorly between the end of this stripe and the last three transverse stripes; two white spots at the knee, a large white spot above each hoof, a white stripe down the inner side of hind leg and on lower side of tail. Gambia to Fanti.

A handsome antelope, this is a frequenter of forest growth, especially open thickets along streams. Büttikofer says it is often common in the neighborhood of settlements. He secured specimens at Bavia, Bendo, Robertport, and on the Junk and the Du rivers. Of secretive habits and well protected by the somewhat impenetrable nature of its favorite haunts, as well as by its remarkably contrasted and broken pattern, this antelope is seldom seen, though it may be fairly common. We secured a native-dressed hide and saw others in use at various places (No. 451). At Kakatown, a very small young one was brought to us alive, on August 24. The pattern was similar to that of the adult but the white markings of the body were much more distinct forming a regular gridiron pattern. Specimens are not available for a closer comparison of Liberian with typical specimens from Senegal.

Boocercus euryceros euryceros (Ogilby). Bongo; "Elk"

Antilope euryceros Ogilby, Proc. Zool. Soc. London, 1836, p. 120: West Africa.

A large reddish-brown antelope with spirally-twisted horns which may be some two feet in length, and are possessed by both sexes; color reddish brown conspicuously marked with a number (14–15) of transverse white stripes; a white chevron on the nose and other white marks on face and limbs. Sierra Leone to Gaboon.

This is the largest and at the same time the most elusive of the Liberian antelopes, an inhabitant of dense forest, shy and wary, seldom seen but occasionally taken by the natives, who use the handsome spiral horns for bugles by cutting a hole in the small end. Büttikofer secured an adult male at Hill Town, a skin without the feet from the Junk River, and a third from the Marfa River. These presented a certain amount of variation in the number of white cross-stripes, the last with eleven on each side of the body, the first with fifteen on the right and thirteen on the left side, and the Marfa River specimen with fourteen on the right and thirteen on the left side. From inquiry among the natives it appears that they sometimes trap the Bongo with nooses and heavy drags but owing to its keenness of scent, sight, and hearing it is almost impossible to approach them unless they are feeding. They live in slightly open "bush" or dense tangles of shrubs and vines, among which they lie concealed during the warmer hours of the day. When surprised they will stand for a moment staring at the cause of disturbance before dashing away. Our hunter, Taylor, averred that they will sometimes lie very close to a trail absolutely concealed, and when asleep will generally rest their head upon a vine which, the moment it is touched, acts as an alarm and the animal is off in a twinkling. It is said that in May and June they may be found in little groups of four, five, or six. It is extremely difficult, however, to find out much of a definite nature. Johnston says that he has seen a pair of horns that were taken within twenty-two miles of Monrovia, possibly from near the localities where Büttikofer secured specimens on the Junk.

Syncerus nanus (Boddaert). West African Dwarf Buffalo; "Bush Cow"

Bos nanus Boddaert, Elenchus Anim., vol. 1, p. 152, 1785: Africa.

A small buffalo, with short horns, which starting from a broad base nearly covering the forehead, sweep straight backward, tapering to a point. Color dull reddish to black (? in old bulls).

The small buffalo of West Africa with short, nearly straight horns is found sparingly in Liberia, frequenting dense "bush," often near the native villages, where it comes forth by night to feed in the rice and cassava plantations. Much harm is sometimes inflicted in this way. Büttikofer mentions a cassava plantation at Buluma that was entirely ruined by buffaloes. His hunter secured a cow at Robertport and he brought back an old bull from the Du River. Johnston says of these that they are of a reddish-yellow color, but dark-looking or blackish individuals also occur which may be older animals. The exact status of this buffalo is still uncertain. Lydekker, in his Catalogue of the Ungulata in the British Museum, concludes that all its named races are forms of *S. caffer*, the longer-horned Cape Buffalo, but in some parts of Central Africa both species are found in the same general region in separate herds, and it seems quite as likely that the smaller animal is a distinct species. We saw nothing of them, though occasional tracks were seen, and once at Lenga Town on the Farmington River, a native came running in with the report that three had appeared near the village. The Chief seized his old musket and set forth in pursuit but came back later empty-handed. Our native hunter, Taylor, says that both black and red ones may be seen together in the same herd; they travel in herds of four or five with often two or three bulls to a herd, though sometimes large solitary bulls may be found. They live in heavy jungles as well as in second-growth forest with tangles of bushes and vines. They feed at night, lying down in the morning from eight till noon, and sometimes resuming their feeding in the afternoon. They are fond of a sword grass with a wide blade. The young are protected by the mother until they are about a year old. The natives sometimes capture the buffalo in pitfalls or with spear traps. In usual hunting it apparently behaves much as does its larger relative, starting off for ten or fifteen yards when alarmed, then coming to a stand to make sure of the cause of alarm, and if danger is detected, making off once more. If wounded, they will circle back on the track, waiting to charge suddenly upon the hunter as he passes. It was the firm belief of our hunter that they usually circle to the left.

HYRACOIDEA

PROCAVIIDAE Hyraxes

Dendrohyrax dorsalis (Fraser). Tree Hyrax

Hyrax dorsalis Fraser, Proc. Zool. Soc. London, 1852, p. 99, pl. 33: Fernando Po.
Hyrax stampflii Jentink, Notes Leyden Mus., vol. 8, p. 209, 1886: near Schieffelinsville, Liberia.

Size of a small rabbit, but short-limbed, round-eared and tailless; color dark mixed gray and black above, silvery below, with a contrasting whitish blaze in the middle of the back, marking the location of a gland. Liberia to Cameroons.

It is generally agreed that Jentink's supposed new species, *P. stampflii*, is merely an immature or variant of the tree-hyrax already described by Fraser from Fernando Po. In case the continental form should eventually prove different from the typical race of that island, Temminck's name *silvestris* (type locality, Ashanti) will probably be found applicable.

It is curious that we saw and heard nothing of the hyrax in all our journey, although Dr. Bequaert saw a young one that was brought in by natives on the Farmington River at Lenga Town. Stampfli secured specimens on the same river and one on the Junk at Schieffelinsville, that later became the type of Jentink's *stampflii;* Büttikofer obtained this animal on the Du as well. He writes that he first was attracted to it by hearing its loud *kerr* note at Hill Town on his second journey to Liberia. By offering a good reward he at length had several brought in alive in baskets. They would erect their dorsal hair, spreading out the white tuft and stamping with their fore feet, and were quick to bite. The natives captured them by blocking up their holes in hollow trees, then chopping the tree down, covering the hole with a fish net, and catching the animals when they ran out. Their holes were usually some eight to fifteen feet up in trunks covered with lianas, and could easily be told by the abundant droppings. In one such trunk were captured a male, female, and young. The old ones eventually escaped, but the young one became very tame and would climb a square table-leg by pressing the soles of its feet against opposite sides. After various fruitless attempts to feed his captives, Büttikofer found that they would take cassava leaves readily. Bates writes that in the Cameroons, they feed a good deal on the ground, and will climb among hanging vines. The Crowned Hawk Eagle is one of their special enemies.

PROBOSCIDEA

ELEPHANTIDAE Elephants

Loxodonta africana cyclotis (Matschie). West African Elephant

Elephas cyclotis Matschie, Sitzb. Ges. Naturf. Freunde Berlin, 1900, p. 194: Southern Cameroons, near Yaunde.

Said to be distinguished from other races of African elephants by the shape of the ear, which is described as an oval with a half ellipse on the lower part; this ellipse or lappet has its free border shorter than the distance from the inner lower insertion of the ear to its top.

The discrimination of the subspecies of African elephants is still most unsatisfactory. Lydekker (1907) attempted to review these and recognized several races chiefly on characters of the ear in mounted specimens, the original shape of which was undoubtedly much altered by the taxidermist's work of preparation. He followed Matschie in supposing the West African form to be rounder-eared than those of East Africa, although he adduced no new evidence of its distinctness. Apparently the ear of the Liberian elephant has not been figured heretofore, hence we present herewith a photograph of one cut from an elephant killed by natives some hours' march from Paiata, near the St. Paul's River. It is assumed that the elephants of the coastal forest strip are the same as those of the Cameroons, where *cyclotis* is typical, but this is by no means certain.

Elephants occur in the more densely forested parts of Liberia, but apparently seldom come out to the coast. Büttikofer relates finding a skull in the forest at Soforé Place, while nearby, on an island in the St. Paul's River, lived a big old

No. 452. — Right ear of elephant from behind. Liberia

No. 453. — Elephant jaws, Trué Town, Liberia

elephant whose tracks he often saw. It occasionally swam the river to either bank to feed in the forest. Two years previous to his visit an elephant was shot at Kisikoro close to Robertport, while he himself saw tracks on the Du. While we did not see this species in Liberia alive we came upon tracks in the forest beyond Kolobanu, where a small herd had crossed our path, breaking a way through the undergrowth as it went. There was the track of a small one in the mud. Tracks were found again near the Du, but we were unable to come up with the animals.

While we were at Paiata, word came of the killing of an elephant a few hours' march away. Two of us accompanied a group of natives to the spot and found the body had been dismembered, and all the meat smoked or carried away, so that nothing remained but the cranium and pelvis, while the ground thereabouts was already a seething mass of fly maggots. The ear of the elephant had been cut off and lay entire near the hunters' temporary camp so that we were able to measure and photograph it. The greatest vertical diameter was 900 mm., the greatest width at the upper border of the meatus 790. It was apparently from a medium-sized cow, without tusks. Unfortunately we had no means of bringing out the skull. Other portions of skulls and jaws seen here and there at villages did not seem especially small (Nos. 452, 453).

Because of the interest attaching to the status of a supposed pygmy race of elephant, described from the Congo, and on account of the fact that W. D. M. Bell in his "Wanderings of an Elephant Hunter" (1923) says definitely that there are two sorts of elephants in Liberia, a smaller red and a larger blue variety that he himself hunted, we made special inquiries on the subject, but failed to secure any satisfactory evidence of a pygmy species. Native hunters told us that they recognized three different kinds but these probably are groups of different ages or individuals differing in the development of their tusks. The three are: (1) tall rangy animals with long thin tusks; (2) large broad-backed individuals with short, thick tusks; and (3) small elephants that "never" become more than six or seven feet high and with very small ivory, not exceeding fourteen pounds. We saw a few tusks that had been bought of natives, and these were small, the largest barely two feet long, thick and stubby, but weighing perhaps not over fifteen pounds. According to native report the first sort go in herds of only two or three together, or there may be one or two old bulls. The second kind is usually found singly or with small ones and prefers marshy country; while the third may be in troops of five or six to ten, usually more cows than bulls. One such herd we followed, had been passing near the Du River, and left many tracks, most of which were from 6.5 to 10 inches in diameter, with one larger series of tracks 18 inches across at a little distance from the others. The natives are keen observers but frequently misinterpret what they see. In the case of the Liberian elephants, the truth probably is that for centuries the local herds have kept more or less to the shelter of this great forested area, and gradually the larger animals have been killed for their ivory, so that the smaller ones now outnumber the larger, giving rise to the belief that the latter are a different kind. The native method of hunting them is with the use of a poisoned arrow having a shaft about eighteen inches long, and a tip of soft iron, somewhat spade-shaped. The shaft is thrust down the barrel of an old smooth-bore musket, and shot into the elephant's body at close range. The animal at once starts off and the hunter follows its winding course in and out through the undergrowth until the poison takes effect and the elephant falls. The hunter returns on the animal's trail, notifies the village, and all the men set forth following the same winding course through the forest till they come to the place where the body lies. Here camp is made, and they stay by until all the meat is cut off, partly smoked or dried, and then pack it back to the village leaving only a few well-cleaned large bones. If the existence of a really small species of elephant is to be established, it must rest on the examination of skulls and teeth that are fully adult and yet of small size, while it would further be expected that there would be some other external peculiarities that would make it more than merely a small edition of the well-known African species.

Dr. George C. Shattuck calls our attention to the fact that the large sebaceous gland found directly behind the eye of an elephant frequently contains small pieces of twigs that apparently entered the orifice of the gland while the animal was feeding or perhaps scratching its head, and have broken off. This gland is branching in form but discharges through a single opening. Both Dr. Shattuck and Dr. Strong found such twigs in two of the elephants they shot, while a third was without them. Geoffroy Catchpole, a white hunter, said he had frequently found sticks in these glands in elephants he had shot and Alexander Barnes mentions it in his book on the Kivu country. Samples of these sticks from elephants shot in the Congo by Dr. Shattuck varied from about 15 to 40 mm. in length and were hard and brown. Their occurrence does not seem to be generally known among the natives or white hunters.

SIRENIA

TRICHECHIDAE Manatees

Trichechus senegalensis (Desmarest). West African Manatee

Manatus senegalensis Desmarest, Nouv. Dict. d'Hist. Nat., vol. 17, p. 262, 1817: Senegal.

General appearance whale-like, the tail broadly expanded into a rounded lobe for swimming; color, bluish black with a tinge of olive green on back and sides, becoming yellowish below. Coast from Senegal to Gaboon.

The West African manatee is well known to the Liberians, who occasionally capture one, but we neither saw nor heard anything of it during our brief stay on the coast. According to Büttikofer, whose description of its coloring is transcribed above, it sometimes comes into the St. Paul's River in considerable schools as far up as the lowest rapids; two adults were taken in the Mesurado River the year previous to his visit; while it is occasionally seen in the Marfa and Cape Mount rivers. He secured a fresh specimen from the latter stream at Robertport that weighed about 500 pounds and measured 2640 mm. in total length. Its stomach contained only vegetable matter.

CETACEA

PHYSETERIDAE Sperm Whales

Physeter catodon Linné. Sperm Whale

Physeter catodon, Linné, Syst. Nat., ed. 10, vol. 1, p. 76, 1758: Northern Ocean.

Length about 50 feet (adult male); head enormous, about a third the total length; lower jaw with about 25 large teeth on each side, upper jaw toothless; color black with more or less white about the mouth.

We were shown two teeth taken from a Sperm Whale that came ashore about a year previous to our visit (about 1925) some twenty-five miles south of Monrovia. These teeth were much worn down, the roots nearly closed, evidently from an old animal.

DELPHINIDAE Dolphins and Porpoises

No doubt a number of species of this family occur in the coastal waters of Liberia, but no specimens or exact records are available. On the return voyage from Monrovia, on November 11, when nearly off Cape Mount, a school apparently of *Delphinus delphis,* the common Ocean Dolphin, travelling in a long line abreast and rather leisurely, passed our ship. They were breaking water or jumping clear out with beautiful clean, curving leaps, entering the water again like arrows, with hardly a splash. We kept passing them headed across our track, as if in review. There may have been fifty or more. Late the same afternoon, a small number passed going in the opposite direction, possibly of another species. They were less active, rising regularly for breath, their dorsal fins cutting the surface, but only rarely did one leap clear. They may have been a species of *Prodelphinus.* On our previous cruise along this coast on July 2, we saw off Cape Verde an enormous school of similar dolphins at about 5 p. m., coming from the southeast and travelling in a north-northwesterly direction. They were in a long line that stretched from one-half to about three-quarters the distance across the horizon, and was perhaps two miles long. They made a great splashing on coming to the surface to breathe, some merely breaking water, others leaping wholly out. Those that jumped out either came up sidewise and soused back on their sides, or would come out in a nearly vertical position, falling back, tail first, while others still made clean leaps out, going in again head first. Those near at hand showed the dark saddle-mark, and so perhaps were *Delphinus* or *Prodelphinus.* When passing our ship the nearest ones dallied a few minutes but all kept on in a long train till lost to sight on the horizon. The very definite direction and steadiness with which they held to it were suggestive of purpose in this movement.

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NOTES ON THE GORILLA

By Harold J. Coolidge, Jr.

The Belgian Government very kindly gave permission to the Expedition to secure one specimen of a mountain gorilla from the Belgian Congo, and I was requested to secure this specimen for the collection. The mountain gorilla is known to inhabit particularly the region of the volcanoes just north of Lake Kivu. However, this territory had been recently made into a reserve, the Parc National Albert. The other localities besides the Kivu District in which gorillas were known to occur were so remote from the route of the Expedition that to visit them would have taken more time than was available. Fortunately the White Fathers at several mission stations in the Eastern Belgian Congo confirmed native reports of gorillas not far from Katana on Lake Kivu, on the mountain slopes to the west of the Lake.

Through the assistance of a Belgian official a number of forest pygmies were secured, and after two weeks' hunting with a South African hunter, I was able to locate several troops of gorillas. Although hunting was made difficult by the very dense rain forest at from 7,000 to 9,000 feet altitude, eventually I killed the leader of one of the troops of gorillas which proved to be a large adult male, and valuable as a museum specimen. Blood smears were made and the animal was examined for parasites. Sections of the viscera were preserved as well as samples of food and spoor. In the intestines a tapeworm was found which is described in the medical section of this Report, page 473. The complete hide and skeleton were brought back to the Museum of Comparative Zoology at Harvard University, where the hide is mounted and on exhibition (No. 454).

EXTERNAL MEASUREMENTS OF THE MOUNTAIN GORILLA PROCURED FOR THE EXPEDITION

(Adult Male, M. C. Z. 23182)

Height, top of skull to heel	1730 mm.
Length, top of skull to end of extended toe	1828
Length of hind foot	300
Height of ear	55
Girth of chest	1574
Top of skull to eyes	240
Top of skull to nose	340
Top of skull to mouth	400
Top of skull to chin	480
Top of skull to ear	170
Top of skull to shoulder	250
Circumference, top of skull around lower jaw	920
Height of eyes	—
Ear to eye	130
Ear to nose	240

Ear to corner of mouth	160 mm.
From ear to ear in front	360
From ear to ear in back	380
Ear to shoulder	130
Ear to ear under jaw	580
Width of ear	40
Eye to eye in front	80
Eye to nostril	90
Eye to corner of mouth	120
Eye to chin	200
Eye to eye behind	640
Width of eye	30
Height of eye	13
Width of forehead	150
Height of forehead to top	240
Top of forehead to end of nose	150
Length of nose	50
Width of nose	50
Nose to corner of mouth	120
Nose to top gum	80
Nose to chin	150
Circumference of head around end of nose	710
Width of mouth, straight	120
Width of mouth along upper lip	260
Length top lip to nose	58
Length bottom lip to chin	63
Circumference of head at the mouth	914
Neck to end of chin	136
Chin to solar plexus	170
Neck, length on side	200
Neck, length from solar plexus	250
Neck, circumference	740
Circumference around the shoulders	2006

Right Side

Length of upper arm, upper side	565
Length of upper arm, under side	394
Length of lower arm, under side	381
Length of lower arm, upper side	533
Circumference of upper arm	470
Circumference at elbow	457
Circumference of lower arm	336
Circumference of wrist	305

Hand Measurements (with hand strangulated closed)

Wrist to end of longest finger	178
Wrist to end of thumb	114
Width of palm	178
Length of palm	178
Length of thumb	51
Length of first finger	76
Length of second finger	102
Length of third finger	89
Length of fourth finger	64
Circumference of palm outside thumb	318

Left Side

Length of upper arm, upper side	—
Circumference of upper arm	457

Circumference at elbow	457 mm.
Circumference of lower arm	336
Circumference of wrist	305
Arm pit to thigh bone	717
Arm pit to crotch, in front	1143
Arm pit to crotch, in back	—
Circumference at arm pits	1448
Circumference around belly or waist	1626
Height from solar plexus to crotch	889
Circumference at hips	1499
Length of upper leg, measured on inside	330
Length of upper leg, measured on outside	381
Length of lower leg, measured on outside	355
Length of lower leg, measured on inside	343
Circumference of upper leg, right	610
Circumference of knee, right	470
Circumference of lower leg	336
Circumference of ankle	330
Foot, width at heel	191
Foot, width at ball	178
Foot, length along outer side	305
Foot, length along inner side	279
Foot, circumference of ball of foot	292
Circumference of big toe	114
Length of first (big) toe	76–82
Length of second toe	28
Length of third toe	38
Length of fourth toe	44
Length of fifth toe	13
Width across toes	95
Length around end of toes	254
Ankle to end of longest toe	229
From collar bone to solar plexus	368
Distance between nipples	273
Circumference of thumb	82
Circumference of first finger	102
Circumference of second finger	108
Circumference of third finger	95
Circumference of fourth finger	82
Circumference of first toe	108
Circumference of second toe	64
Circumference of third toe	67
Circumference of fourth toe	70
Circumference of fifth toe	79
Top of head to end of tail	1041
Arm pit to end of tail	838
Width of hips	533
Pelvis to anus	305
Arm pit to groin	635
Width of silver band on back	305
Pelvis to knee joint	660
Pelvis to shoulder	660
Neck to anus, front	1168
Length of penis	51
Length of arm	965

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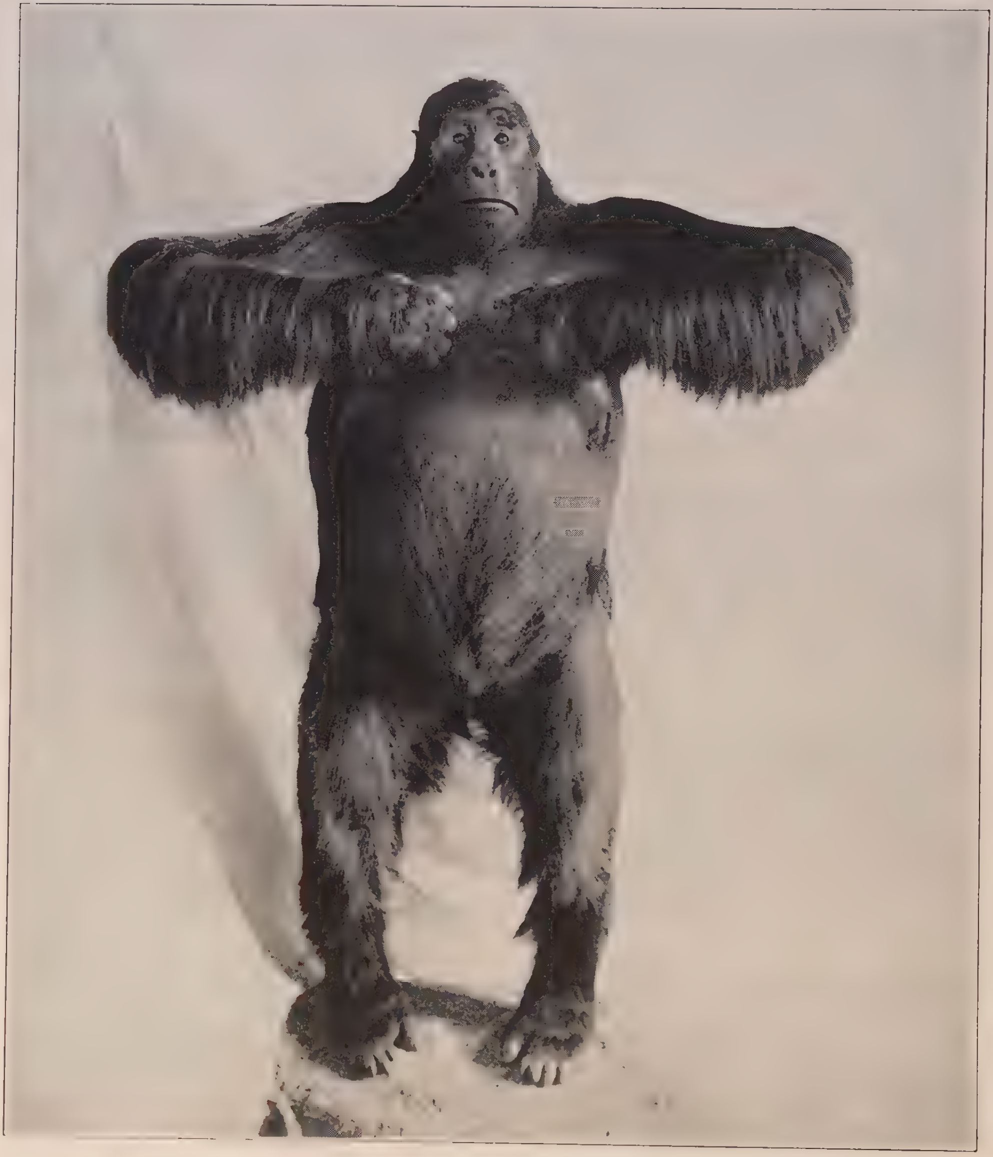
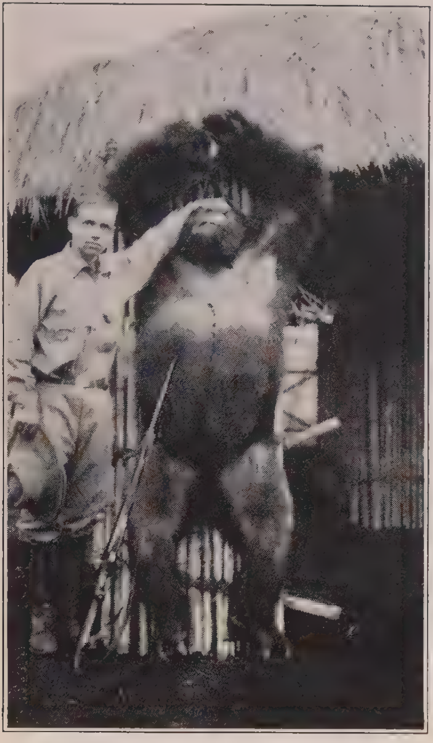
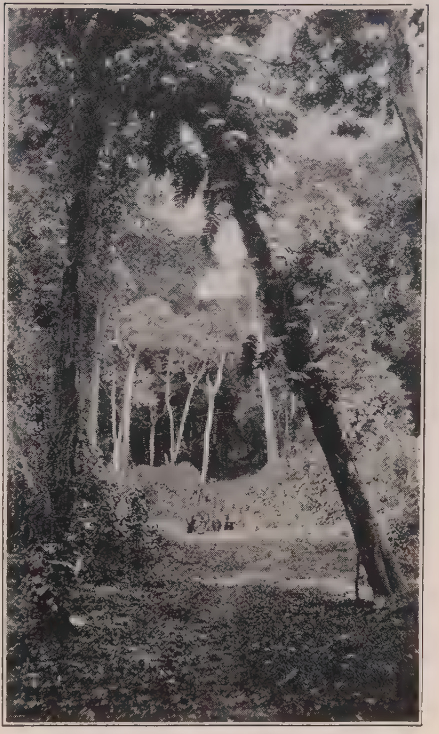


No. 454. — Mountain gorilla, west of Lake Kivu, Belgian Congo, as it appears in the Museum of Comparative Zoology



No. 454b. — Mountain gorilla, showing relative size



No. 455. — Mountain trail into gorilla country, altitude 8500 feet

No. 456. — Trail into gorilla country, pygmies in foreground

No. 457. — Mountain forest in gorilla country

It was in collecting this specimen that I first became interested in the study of gorillas, and was surprised to find how comparatively little scientific knowledge there was about this animal. A year's research work in zoology in Cambridge, England, gave me an opportunity to study the gorilla, to visit the important museums where there are large collections of skulls, and to gather the necessary material for the publication of the revision and classification of the group.

Since a dozen or more different species of gorilla are currently recognized in nomenclature, a special study was made in order to see which of these might be valid. In the course of this investigation most of the material in the larger museums of Europe and America has been carefully studied, measured, and photographed, and the types of practically all the named races were seen. By way of summary, it may be said that most of the nominal species that have been described in the last thirty years are based on extremes of variation and do not represent distinct geographical forms. The existing races of *Gorilla* are here recognized as: the Coast gorilla (*Gorilla gorilla gorilla* of Savage and Wyman), found in the lowlands of the Cameroon and Gaboon region; and (2) the Mountain gorilla (*Gorilla gorilla beringei* of Matschie), which occurs in the forests of the Kivu country and the mountainous regions of Central Africa immediately west of the Great Lakes. The characters separating these two forms are set forth in detail in the complete report. Their ranges are apparently distinct, for there is a considerable intervening area in the northern Congo region over which gorillas are not known to occur.

In the complete monograph[1] the summary of the comparison of skulls says:

In all the twenty-six measurements just recorded there is such uniformity that there are no grounds for doubting that all the gorillas measured belong to one species. The tooth measurements are remarkably similar and suggest no basis for subdivision of the species. The length and width of the ascending branch of the ramus, the length of the occiput, the height of the sagittal crest, all show considerable variation that is very much an individual characteristic, but in no way correlates the skulls into definite groups.

When dealing with the most important measurements, while there is no doubt that all the gorillas belong to a single species, one does find a certain grouping of the skulls within this species. The curves that represent these more important measurements all overlap each other, which shows an intergradation, but the peaks of the curves do not necessarily coincide. They show a distinct division into two groups: the Kivu and Eastern Mountain making up one group, and the Cameroons, Gaboon, and Western Cameroons representing the other group.

By way of summary, the following important measurements indicate a division into two groups, the Coast and the Mountain gorillas. These measurements overlap, but nevertheless show a significant difference in their averages.

The greatest total length — Coast longer, Mountain shorter.
Palatal length — Coast shorter, Mountain longer.

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[1] Coolidge, Harold J., Jr.: 'A revision of the genus *Gorilla*.' Mem. Mus. Comp. Zoology at Harvard College, vol. 50, No. 4, August 1929, pp. 293–381, 21 Plates and 2 Maps.

Zygomatic width — Coast greater, Mountain lesser.
Mastoid width — Coast greater, Mountain lesser.
External cranial width — Coast greater, Mountain lesser.
Orbital width — Coast greater, Mountain lesser.
Outside intercoronoid width — Coast greater, Mountain lesser.

In all the above, the Coast is the greater, except in length of palate.

The following measurements show the same grouping to a smaller but nevertheless noticeable degree.

Basion-nasion — Coast longer, Mountain shorter.
Cranial height — Coast greater, Mountain lesser.
Condylar width — Coast greater, Mountain lesser.

The following tend to group the Mountain gorillas together with usually one group of the Coast gorillas as a sort of intermediate between the Mountain and the other Coast animals.

Basal length — Mountain greater, Cameroons intermediate, Coast lesser.
Cranial length — Coast greater, Western Cameroons intermediate, Mountain lesser.
Orbital arc (average) — Coast greater, Western Cameroons intermediate, Mountain lesser.
Greatest width across jaws posteriorly — Mountain greater, Western Cameroons intermediate, Coast lesser.

It seems as if there were sufficient difference of degree with intergradation to indicate subspecific relationship between the *Mountain* and the *Coast* gorillas.

The following tooth measurements show such uniformity that of themselves they can justify no subdivision of the species.

Length of upper tooth row c-m^3
Length of lower tooth row c-m_3
Outside alveolar width across m^2
Outside alveolar width across m^2
Inside alveolar width across m^2
Inside alveolar width across m_2

The following characters show such an enormous individual variation that they are of no value in subdividing the species: —

Sagittal arc.
Height of occiput.

The following measurements show uniformity, except with respect to one group, that may make them of interest: —

Height of ascending process of ramus, uniform (except in a small group of Western Cameroons gorilla).
Greatest anteroposterior length of ascending process of the ramus, uniform (exception, Kivu ramus slightly narrower than rest).
Outside intercondylar width, uniform (exception, Eastern Mountain the narrowest).

Having tabulated measurements that show no difference in degree and those that divide the skulls into two groups, we may now consider the geographical groups, one by one, and any significant characteristics that are revealed in their curves or measurements.

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Under *Mountain* Gorilla: —

Kivu: Height of occiput — shortest.
    Greatest anteroposterior length of ascending ramus — least.
    Outside alveolar width at m^2 — least.
    Length of upper tooth row, c-m^3 — longest.
    Sagittal arc — least (lowest crest).
    Length of rostrum — shortest.
Eastern Mountain: Outside intercondylar width — least.

Under *Coast* Gorilla: —

Cameroons: None.
Gaboon: Cranial length — longest.
    Orbital arc — greatest.
Western Cameroons: Palatal length — shortest.
    Orbital width — greatest.
    Cranial length (divided into two groups, one similar to Mountain, other to Coast).
    Intercoronoid width — greatest.
    Height of ascending process of ramus — small group from this region have much the shortest.

Under this grouping the Kivu and the Western Cameroons would be the only groups worth considering as possibly separable from the rest. The distinctive differences are all small and do not seem to be of sufficient degree to justify making either of these groups a separate subspecies in the present state of our knowledge.

Briefly to sum up: — The African gorillas show no differences of kind sufficient to justify the recognition of more than the one original species *Gorilla gorilla* (Savage and Wyman). There does exist, however, a difference in degree not very great, but sufficient to separate the Coast from the Mountain gorillas. These differences based on average skull measurements give the Coast gorilla the maximum in greatest total length, zygomatic width, mastoid width, external cranial width, orbital width, outside intercoronoid width, basion-nasion, cranial height, and condylar width; the Mountain gorilla the maximum in palatal length.

As the type form is the Coast gorilla and the first-described Mountain gorilla was *Gorilla gorilla beringei*, it is proper to use the latter name for our Mountain gorilla subspecies. Undoubtedly some naturalists will distinguish the Eastern Mountain race from the Kivu and will continue to use for it the name *graueri*, and for the Coast gorilla of the Western Cameroons the name *diehli*. However, from a study of the existing specimens of gorillas in the museums of the world, I see no sufficient justification for giving *graueri* or *diehli* the rank of a distinct subspecies.

There exists then only one species represented by two forms: — *Gorilla gorilla gorilla* from the coast and *Gorilla gorilla beringei* found in the mountains of the eastern Congo.

The conclusion says with regard to classification:

In this study I have tried to bring out what seem to me the important specific or subspecific differences found among gorilla skulls in view of the new light and knowledge that we have on the matter of individual variation.

Nos. 458, 459, 460, 461. — Pygmies in gorilla country, west of Lake Kivu

After taking all things into consideration my conclusion is that the gorilla, particularly the adult male, shows a large individual variation even within the limits of a small area; that there is no difference in kind between the Coast and the Mountain gorillas such as to justify making of them two separate species, but that there is a distinct difference in degree sufficiently important to constitute a subspecific difference between the two groups. While I have reached fairly definite conclusions based on a careful study of all available material, I fully realize that other conclusions may be reached by future investigators when further masses of material have been accumulated.

Revised Classification:

Genus and Species: *Gorilla gorilla*
Gorilla gorilla gorilla (Savage and Wyman) — Coast
Gorilla gorilla beringei Matschie — Mountain

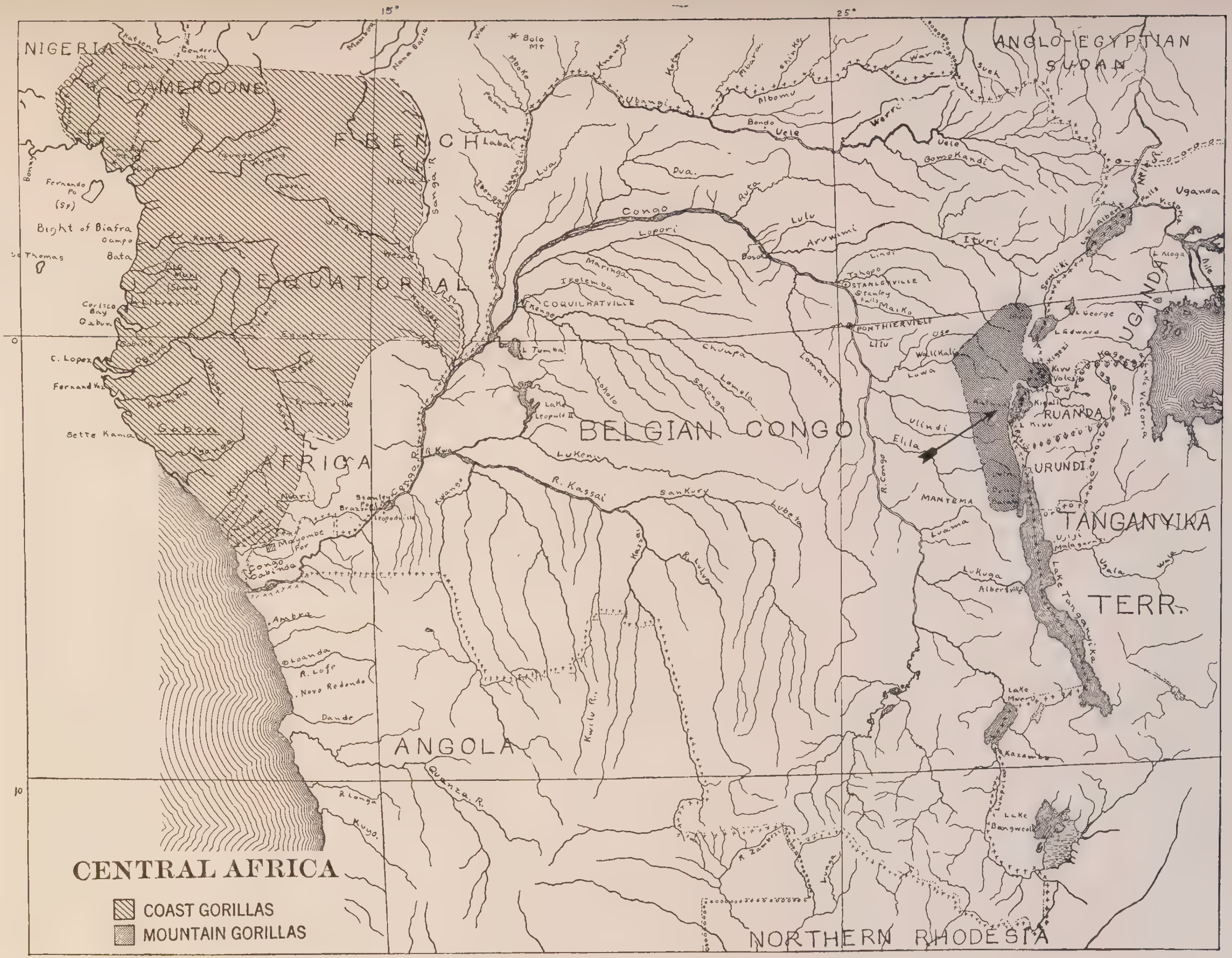
The external characters that distinguish the Mountain from the Coast gorilla are, besides a longer palate and a generally narrower skull, the thicker pelage, shorter arms and longer legs, large amount of black hair, and fleshy callosity on the crest.

A table of average skull measurements is here appended for the Coast subspecies and the Mountain subspecies.

Average Skull Measurements of Coast and Mountain Gorillas

(Based on Study of 310 Adult Male Skulls)

	COAST mm.	MOUNTAIN mm.
1. Greatest length	296	292
2. Zygomatic width	179	174.1
3. Cranial length	193	188
4. Cranial width	103.8	98.3
5. Cranial height	114	113.5
6. Orbital width	114	108
7. Mastoid width	159	154.9
8. Height of occiput	97	96.6
9. Palatal length	113	125.8
10. Basal length	196	204
11. Gnathion to nasion	124.8	126.3
12. Nasion to basion	136.8	134.8
13. Outside intercondylar width	145	142.5
14. Outside intercoronoid width	125.4	114
15. Condylar width	37.2	35.7
16. Length of ascending process of ramus	73.8	75.6
17. Height of ascending process of ramus	120	123.5
18. Greatest width across jaws posteriorly	124.8	136.8
19. Length of maxillary row	87.8	92
20. Outside alveolar width, upper tooth row	73	74.1
21. Inside alveolar width, upper tooth row	40.6	37.3
22. Length of mandibular tooth row	96.3	101
23. Mandibular width outside alveoli	65.2	68.5
24. Mandibular width inside alveoli	35.3	36.8
25. Orbital arc using a base of 50 millimeters	74	69.7
26. Sagittal arc using a base of 50 millimeters	97	92.5



Map No. VIII. — Distribution of coast and mountain gorillas

The report also makes a study of the geographical distribution of the gorilla (see Map VIII).

The gorillas of Africa are found in two limited equatorial regions, separated by a section of the Upper Congo basin that extends from 16° east to 29° 45′ east. The greater part of this intermediate region is covered with dense equatorial forest and, with the exception of three skulls reported as found in a native hut near Bondo, 23° 50′ east on the Uele River, we have no authentic evidence that gorillas exist there. The skulls referred to are similar to those of the Cameroons and might well have been carried over by natives. For convenience in distinguishing the two groups, I shall again refer to the western ones as the Coast gorillas, even though most of them live at some distance from the Atlantic and some inhabit a mountainous region. The eastern ones are largely found in the highlands of the eastern Congo and will be called the Mountain gorilla (although my friend, Major Collins, shot one at an altitude of a little over two thousand feet near Walikale).

The distribution of the two groups can be seen by referring to the accompanying map.

The limits of the range of the animal on the coast have been determined largely by plotting in all the places whence skulls that seem reliably labelled have come, and by outlining this area.

For the Coast gorilla, the westernmost boundary approximates the Cross River in the southern provinces of Nigeria. The most westerly point actually recorded is Ikom, 8° 40′ east and 6° north. The northernmost point is close to Basho, 9° 25′ east, 6° 7′ north. On the east we have reports from several places such as Wesso and Nola on the Sanaga River. The Sanaga River, about 16° 15′, seems to mark the eastern boundary of the range of the Coast gorilla. On the southeast the line follows the border of the forest which reaches its southernmost limit at Mayombe on the edge of the Belgian Congo, 5° south, 13′ east. Along the Atlantic coast in most places the forest begins a little way inland. Gorillas have been reported actually on the coast, but generally they are found not closer than thirty miles from the sea. They seem especially plentiful along the Gaboon, Ogowe, Camp, and Sanaga rivers.

The Mountain gorilla is found in a comparatively narrow strip of the eastern Congo. Its principal habitat is the mountain forest as distinguished from the lowland forest of the Belgian Congo. Its northern limit is Mulu, 0° 10′ south, 29° 10′ east (Absil and Chapin). We find it as far west as Walikale, 1° 20′ south, 28° 1′ east, where it strays a little into the lowland forest. The eastern limit seems to be close to Kigezi in Uganda, 1° 15′ south, 29° 45′ east. The southern limit is Baraka on Lake Tanganyika, 4° 19′ south, 29° 2′ east. In this entire region the gorillas that are most known and accessible are the troops that inhabit the volcano regions where Akeley died while studying them. Whether they are entirely isolated from contact with outside gorillas at the present time is doubtful and has not yet been established. In the mountains back of Baraka, Boko, Uvira, and Katana large troops have been recently found in the upland forests.

An interesting problem is open to anyone who could devote the time to studying the causes of this surprisingly limited distribution. It may be due to lack of some necessary element of food, to some climatic condition, or to natural obstacles. I feel fairly sure that it is not because the gorilla is sedentary in habits or very limited in numbers.

XXXIV

THE BIRDS OF LIBERIA

By Glover M. Allen

INTRODUCTION

Previous to the classical investigations of Büttikofer and his associates, the natural history of Liberia had been very little studied and practically no collections of birds made. Apparently Robert MacDowell, a United States Consul to Sierra Leone, was the first to collect birds in that country, for, according to Büttikofer, he secured a number of birds on the St. Paul's River about 1840. A specimen of *Coracina azurea* which he sent to Cassin was described by the latter in 1851, from a bird which though not specifically so stated, is assumed by Büttikofer to have been taken in Liberia, for which it is the only record. From 1875 to 1877, the German traveller, Schweitzer, procured a number of birds, mammals, insects, and mollusks in the neighborhood of Monrovia, and these were sent to Dr. H. Dohrn of the museum at Stettin, Germany. Unfortunately Schweitzer died shortly after his return home as a result of sickness contracted during his stay in the tropics. In 1879 came to fruition the plan of Dr. Hermann Schlegel, Director of the Royal Museum at Leyden, to send an expedition to Liberia to investigate its fauna. To carry out this work he dispatched J. Büttikofer and Carl F. Sala to the West Coast, where for two and a half years, they collected in so thorough a manner that very little has since been added to the list of Liberian birds and mammals. Sala died of fever in 1881, but Büttikofer returned to Europe with somewhat impaired health. Two years afterward, feeling still unfitted to make another journey to the tropics, he sent at his own expense, his old hunting companion, F. X. Stampfli, to carry on the work so well begun in Liberia. From May, 1884, till the spring of 1886, Stampfli made collections chiefly on the Junk and Mesurado rivers, supplementing the explorations of Büttikofer and Sala who had largely worked at Grand Cape Mount and on the St. Paul's River. In November, 1886, in company with Stampfli, Büttikofer returned to Liberia to continue his investigations for a few months, making excursions to various points along the coast, and up some of the larger rivers for a short distance. Stampfli remained for a few weeks longer to explore the lower course of the Farmington River, and later returned to Europe. The work done by Büttikofer and his associates, including a native collector, A. T. Demery (who continued to send birds, making one journey of several days' travel up the Marfa River), forms the basis of our knowledge of Liberian natural history, more particularly of its birds and mammals. Since his day but little collecting has been done. Small collections of birds and mammals were sent to the U. S. National Museum from Mount Coffee, on the St. Paul's River, by R. P. Currie in 1897 and briefly reported on, and in 1905 Charles Chubb recorded various birds sent by British officials stationed in Liberia. The same author prepared a summary list of Liberian birds to accompany the brief notes on the avifauna by Sir Harry Johnston in his two-volume work, "Liberia," published in 1906. Finally, the brief though important visits of Mr. Willoughby P. Lowe to localities on the Kru coast of southern Liberia, in December 1910, January 1911, and again, for a single day each in February and March, 1911, carried out as part of a season's collecting on the West Coast, added several important species to the list. Our own work was of necessity hurried, but it covered a part of the country that was previously unknown ornithologically, most of it, however, differing little in character from the heavy forest so well worked by Büttikofer. The eastern part of Liberia is doubtless somewhat transitional to the drier country of southeastern Sierra Leone and French Guinea so that interesting comparisons were made possible with the list published by Kemp (1905) of birds collected at Bo, in that country. The time of our visit was at the height of the rains, which not only made travel difficult, but added to the difficulty of collecting and preparing specimens; yet this had the advantage of permitting a more careful contrast of the list of birds seen with those obtained at more favorable seasons by previous collectors, indicating that several species probably are absent locally from certain regions during the wet times. Büttikofer (1885) writes: "In August the rains set in with double strength and a whole week of continual rain is nothing unusual during this period. The small rivulets, clear as crystal in the dry season [December to March], are swollen to rivers, the forest-marshes to lakes, above which brushwood and high forest make a very dreary-looking appearance. The lower forest-regions get inundated by the swelling rivers, and the narrow foot-paths . . . are for a great deal impracticable." In spite of the difficult conditions, however, we secured 137 species of birds, 21 of which had not previously been recorded from Liberia.

In the following list of the birds of Liberia, based on the work of previous writers, are given: first, the Latin name in current use, followed by the quotation of the original reference where each species is described, and the type locality; next comes a very brief description designed to help in the identification of specimens, particularly for anyone slightly familiar with birds who may be living in Liberia; the range in Africa follows and then a summary of what has been published on the habits and occurrence of the species in Liberia, together with our own notes where these seemed sufficiently important. The present list, revised and corrected, comprises 281 species or subspecies; that of Büttikofer (1889) included 229 to which he later added two more. The order and nomenclature are those given in Sclater's (1924) Systema Avium Ethiopicarum, Part 1, from Struthionidae through Picidae, but from that point to the end of the list, the works of Sharpe and Reichenow have been chiefly followed. For much kindly help and criticism in the preparation of the list, I am indebted to Messrs. Outram Bangs and James L. Peters, of the

Department of Birds, Museum of Comparative Zoology, and to Dr. Herbert Friedmann, Curator of Birds, U. S. National Museum, who has made a special study of African birds; nor can I let the opportunity pass without acknowledging the enthusiastic help in collecting and preparing specimens in the field rendered by my associates in the Expedition, particularly by Mr. Loring Whitman, Dr. Joseph Bequaert, and Dr. David H. Linder.

Ecology

In its primeval state Liberia was no doubt very largely covered with high forest favored by the heavy rainfall and tropical heat, for this corner of Africa is said to have the greatest annual rainfall of any part of the continent with the possible exception of Sierra Leone or the northern Cameroons. According to Sir Harry Johnston, the annual precipitation for the coast region near Monrovia may exceed 150 inches, and probably diminishes slightly as one goes inland toward the Mandingo country in the northeast portion of Liberia, where the land rises somewhat. His map (1906, vol. 2, p. 523) outlines the forest region as extending in a narrow belt from the Gulf of Guinea to the southern border of Gambia, as a thin prolongation of the Congo Basin forest. At its widest part it is represented as including the entire width of Liberia but undoubtedly it is less heavy and extensive eastward of that country as the rainfall diminishes and the forests give place to scattered tree growth and grassy plains in French Guinea. There is no doubt that human agency is responsible for a considerable modification of the Liberian area through the gradual clearing of the forests by the natives and the preparation of this cleared land for rice crops over a long period of time. Especially in the eastern part of the country and locally here and there along the more travelled routes leading back into the interior, these clearings are very extensive, but usually the original condition of the country may be guessed by the fact that here and there between cleared areas or along the tops of ridges remnants of the original giant trees still stand, or more extensive patches of virgin forest remain with nothing but clearings and occasional areas of low scrubby second growth for long distances between. Probably, as elsewhere in the forest area of Africa, the once transcontinental forest has gradually dwindled, due in part to lessened atmospheric moisture to the eastward, in part perhaps to slight changes of level, forming barriers that withdraw a certain amount of this water, and again, perhaps, due chiefly to human agency in cutting down the virgin forest, thereby drying out small areas which do not recover for many centuries, if at all. Originally Liberia probably offered two chief types of habitat, each with its characteristic fauna and flora, namely, the forest, with its several stories of higher and lower trees and the thickets of vines and bushes underneath, especially along the edges of openings; and second, the waterways or permanent streams which transect the land from east to west or nearly so at frequent intervals. The effect of human agency has been chiefly to modify the forest environment, by causing openings into which come various species characteristic of open ground or of the low thickets and edges of the copses which presently spring up, or which inhabit the grainfields in clearings; while in the immediate vicinity of the villages themselves there come in a number of satellites that seem to profit in some way by the proximity of man. In addition to the groups of birds characteristic of these types of habitat there are a few water birds chiefly found along the seaboard and immediate seashore, that seldom penetrate inland. While most of the native species are largely sedentary, a few appear to be more or less migratory, while a few are northern-breeding species that occur as migrants passing through to other parts of Africa for the winter, or reaching Liberia as winter visitors without going much farther south. These different groups may be briefly listed with somewhat more detail at this point.

The River Birds

A number of birds are practically confined to the immediate vicinity of the streams or the shores of lagoons and pools. Of the larger species most are fish-eaters that habitually frequent the water in search of food, and at other times rest on the shores or on perches close to water. Such are the cormorants and darters of the lower courses of the streams, and several species of heron that hunt along the shores or wade the lagoons. The Reef Heron (*Demigretta gularis*) seems to show a preference for the mangrove swamps that border the seashores while the Green-backed Heron (*Butorides striatus atricapillus*) and the White-backed Night Heron (*Nycticorax leuconotus*) also are commoner coastwise in similar situations. Otherwise the mangrove swamps are rather thinly populated. The Liberian Green Ibis (*Lampribis splendida*) follows up the streams inland well into the forest, while the Finfoot is common along these waterways into the smaller streams and pools of the interior. While the Spur-winged Goose and the Comb Duck seem to occur only rarely about the mouths of some of the larger streams with broad areas of shoals, as at Cape Mount, the Hartlaub's Teal (*Pteronetta hartlaubi*) and probably also the White-faced Tree Ducks are found in the wooded swamps and along the forest streams. The African Dwarf Bittern (*Ardeirallus sturmii*) is said to occur only along the freshwater pools and creeks in high forest, while the Common Sandpiper (*Actitis hypoleucos*) seeks the more open parts of the shores. Several of the fisheating kingfishers haunt the streams for their favorite food, one, *Alcedo rudis*, confined almost wholly to the coast and tidewater, others, as the Giant Kingfisher (*Megaceryle maxima*) and several smaller species including the Shining Blue (*Alcedo quadribrachys*) and the Malachite Kingfishers (*Corythornis cristata*), following the rivers and smaller streams far into the forested interior. The White-headed Plover (*Xiphidopterus albiceps*) and the Chestnut-collared Pratincole (*Galachrysia nuchalis liberiae*) are peculiar in requiring special conditions of habitat. The former is confined to rocky islets or sandbars in rivers where the current is swift while the latter is found in much the same sort of places, especially in the vicinity of falls and rapids so that they become exceedingly localized in their range. In addition to these, there are a few small passerine birds that are very strictly associated with the streams. Such are the River Swallows (*Hirundo nigrita*), that nest on stranded tree trunks, selecting only such as are completely cut off from contact with the banks. These swallows course up and down the streams to which their activities are almost wholly confined. Equally characteristic of the edges of especially the smaller streams with wooded or bush-covered banks are the little gray River Flycatchers (*Alseonax lugens*) that seem to spend their entire lives within a few feet of the water's edge, flitting from one perch to another or out across the current in pursuit of insects, and usually associated closely in pairs. Another flycatcher, a small blue-gray species, *Fraseria cinerascens*, also haunts the river banks keeping in the shaded underwood along the edges of quiet pools. Equally characteristic of the more open river shores, the rocks and sandy edges of the larger streams are the Pied Wagtails (*Motacilla aguimp*) which also are usually found a pair at a time here and there, seldom going far from the vicinity of the water. All these are rather common species that one might wholly miss unless he walked the stream banks or better still, followed the winding course of the rivers, large and small, in a native canoe.

The Forest

The dominant type of environment in Liberia is the great forest that covers much of the interior, becoming probably much less dense in the northeastern part of the country where rainfall is slightly less and where the human occupation has resulted in more extensive clearing and cultivating of the land. From available accounts, the southern half of Liberia is less thickly populated and the virgin forest covers the greater part of the area. To one who sees this forest for the first time, it is a thrilling experience, as if he had been translated into a new world. As seen from a canoe in passing up one of the many little rivers, the tidal swamps with their clean-trunked mangroves seem barren enough in the lower reaches, but once above the influence of tide water, one traverses a belt of screw palms and long-fronded Raphias that grow in vast swampy stretches and give so primitive an aspect to the landscape that it requires no imagination to feel that one is living back in Carboniferous times when such vegetation may have dominated this same country. As the land rises very slightly the trees appear in a boundless storied forest, with here and there giant silk-cotton trees standing above the rest, their clean pillar-like trunks rising well over a hundred feet before giving off their huge candelabra of branches. Most of the trees are less lofty and form a second story, beneath which are ranks of lesser height, while the forest floor itself is covered by a growth of slender bushes and vines which in places may be open enough to be readily passable or again form dense and tangled masses, where the smallest vines are as tough as wire and often thickly beset with thorns so that progress is slow and tedious, and hardly possible for a white man in his civilized clothes without the help of wirecutters, though the native armed with a short, heavy bush-knife easily winds in and out, deftly cutting his way as he goes. In these silent forests it is noticeable that there is but little accumulation of humus or leaf mold, probably because the multitudes of ants, termites, and fungus agencies of decay destroy it nearly as fast as it forms. The abundance of ants of various species both ground- and tree-living, affords a staple source of food to many species of birds, mammals, and reptiles, but the hordes of driver ants that travel in dense columns and here and there spread out to overrun square rods of territory and devour every living animal in their path must help to make the country largely untenable for many ground-living or ground-nesting species.

A large proportion of the birds of Liberia are typically forest-dwelling. Characteristic among these are several of the hawks and eagles, as the great Crowned Hawk-eagle (*Stephanoaëtus*), that probably preys chiefly on monkeys, the Gold Coast Serpent-eagle (*Dryotriorchis*) confined to the West Coast forests, the handsome little Hartlaub's Sparrowhawk (*Accipiter hartlaubi*) and the larger West African Goshawk (*Astur tachiro macroscelides*) both of which haunt the shady thickets and forest trees preying on insects and small birds. Several species of pigeons are found in the forest. The beautiful Green Fruit Pigeon (*Vinago calva sharpei*) and the Banded Pigeon (*Columba unicincta*) haunt the tree tops while in the denser undergrowth are the ground-living species such as the Tambourine Dove (*Tympanistria t. fraseri*), more often heard than seen in the forest depths, and the rarer blue and chestnut Odu Dove (*Calopelia puella*). Birds of the forest undergrowth also are the Latham's Francolin, spotted black and white, and the rare White-necked Guinea-fowl (*Agelastes*). The West African Crested Guinea-fowl is also a forest-dweller, seldom seen, though often coming out from the forest to feed in secluded clearings and old rice-fields of the natives. At least two species of large wood rails (*Himantornis haematopus* and *Canirallus oculeus*), perhaps also *Sarothrura pulchra*, occur in the swamps of the forest, and are snared by the natives at openings in small fences run for hundreds of feet through the woods. The common Touraco (*Turacus macrorhynchus*) is one of the noisy species whose loud woodeny calls resound in the forest, and like its relative the big Blue Plantain-eater (*Corythaeola*) may often be seen running along the branches or scaling from tree to tree in short flights. The common Gray Parrot (*Psittacus erithacus timneh*) and the rarer Black-collared Love-bird (*Agapornis swinderniana*) feed by day in the tall tree-tops, or fly screeching by high overhead. Hornbills of several sorts also frequent the upper story of the forest, feeding on fruits of various kinds. Most conspicuous are the big Yellow-casqued Hornbill (*Ceratogymna elata*) and its rarer relative the Black-wattled species (*C. atrata*), whose heavy wingbeats may often be heard overhead though the birds themselves cannot be seen for the dense foliage. The Long-tailed White-crested Hornbill (*Tropicranus*) and several smaller species of the genus *Lophoceros* are common, though the latter are as often found on the edges of woods and in trees bordering clearings. Twice we found the big Eagle-owl (*Bubo leucostictus*) by day in deep forest or resting in huge silk-cotton trees and no doubt other owls are chiefly confined to the forested area. The Trogon (*Apaloderma*) is especially interesting as a bird so closely associated with heavy tree growth that in Africa it has retained a foothold in the forest region only and is represented by various relatives in similar surroundings in the New World tropics. Several species of sunbirds haunt the upper stories of the primeval growth especially at times when the trees are in flower. Insectivorous Kingfishers, as the Gray-headed (*Halcyon leucocephalus*) and the Chocolate-backed (*H. badius*), are occasional in the lower story of the forest, as well as sundry species of barbets, two of orioles, and two of drongos (*Dicrurus*), of which the Fork-tailed is the commoner species, interesting as a sort of flycatcher-like modification of the starlings. Woodpeckers are uncommon but two or three dull-colored species that feed chiefly on ants are occasionally seen. Now and then one catches a flash of color as a beautiful orange and blue-black Paradise Flycatcher sweeps past an opening to alight among the thickets farther on, but in the lower story of the forest and among the thickets generally the birds are prevailingly dull in color, chiefly olive green with a touch of yellow or white to break the concolor effect, as among the bulbuls, or again the birds may be dense black like the shadows relieved by a touch of scarlet or chestnut as many of the thicket-loving forest weavers of the genera *Malimbus*, *Nigrita*, or *Melanopteryx*. A persistent singer in shaded tangles of hanging vines is the Yellow-whiskered Bulbul (*Andropadus latirostris congener*) while the larger and talkative White-bellied Bulbul especially favors the swampy parts of the forest, where Raphia palms grow in the standing water or by the edges of streams. On the forest floor Ant-thrushes (*Pitta*) and some of the wren-like or thrush-like birds of the genera *Alethe*, *Geocichla*, and *Turdinus* are common though exceedingly difficult to see in the tangled thickets and still harder to collect, for at the least movement they are gone. Caution overcomes curiosity in these forest and thicket birds, for they seldom pause to look the intruder over but dash into the midst of a dense bush instead of stopping on the outer part, and birds flying across a forest path disappear at once into the jungle of the opposite side without waiting to see what it was that frightened them. This habit is in such marked contrast to the more inquiring ways of many of our northern birds that it was at once noticeable. Of all the thicket-dwellers, the little Olive-green Bulbul is perhaps the commonest and at the same time one of the very elusive ones. So well does it keep concealed in the densest cover that even though its song was daily heard about the villages and on the edges of the forest it was weeks before we were able to connect the singer with its somewhat wren-like utterance. Bush shrikes of several species are common in the lower story of these woods, of which the Yellow-spotted (*Nicator chloris*) is perhaps the one most often heard, for all are so secretive and inhabit such dense cover that their presence is difficult to detect and for several there are only one or two records by Büttikofer and his associates who collected birds intensively for several years. A number of small flycatchers live in the thickets along streams or in the more open places of the forest, such as the species of *Diaphorophyia* with a curious wattle over the eye, a slaty-blue *Trochocercus*, the White-throated Flycatcher (*Pedilorhynchus comitatus*), and others of the genera *Bias*, *Megabias*, *Cassinia*, and the broad-billed *Smithornis*. The number of inconspicuously colored bulbuls is notable, including several species each of *Andropadus*, *Bleda*, and *Phyllastrephus*, and such timaliines as *Cossypha*, *Bessonornis*, and *Stiphrornis*, besides a number of small warbler-like species that especially frequent low, bushy growth along the streams, in openings of the forest, or at the borders of clearings. These include the green *Camarophoras*, which remind one somewhat of our Yellowthroats (*Geothlypis*), the curious short-tailed *Sylvietta* and *Amaurocichla*, as well as a few small weaver finches, including *Quelea*, *Spermospiza*, *Pyrenestes*, and *Pytelia*. Obviously the number of forest-dwelling species is large, and these are sufficiently diversified in habitat preference to occupy the various types of forest cover. Many are wide-ranging in the forested area of West Africa, often with slightly different representatives in the Cameroons and elsewhere in the Congo Basin.

Alterations of the Forested Areas

The effect of centuries of human occupation has been gradually to eat into the original forest cover, especially at its edges, and to a less extent in scattered areas within the forest, so that with the felling of trees, burning the trunks, and later clearing the areas entirely and planting them to crops of upland rice and manioc, a complete change in the nature of the ground cover is brought about, resulting in the withdrawal of most of the tree-dwellers, while some of the thicket-loving species remain to haunt the dense growth of thorns, bushes, and weeds that close in the edges of such areas.

On the Du River where virgin forest had lately been cleared and burned so that the bare earth was exposed over a number of acres, we found that several species of open-country birds were already coming in, although the area was nearly surrounded by long stretches of tall woods. Thus there were several small groups of Gould's Pipits (*Anthus leucophrys gouldi*) feeding on the ground; one or two pairs of the large Reed Warbler (*Cisticola lateralis*) haunted the edges of the less barren spots, and sang cheerily from the tops of stumps that still remained standing; the common ground doves (*Turtur afer kilimensis*) walked about to pick up various bits of food, and small weaver finches, especially the black and white *Lepidopygia*, came to drink at the brook or pools exposed by clearing away the trees. Where the trees had been felled some time before, a thicket of low shrubs, vines and tall weeds was already springing up, making suitable places for the Red and Black Weavers (*Pyromelana*) to hang their nests in the weed tops, while in the bushy thickets were a few pairs of Grass Warblers (*Prinia*), and perching on the tops of bushes an occasional Spurred Coucal (*Centropus senegalensis*), birds for which this area would have been quite unsuitable before clearing. In places where clearing and cultivation have been going on for a good many years, parts of the cleared spaces gradually revert to bushy growth again, and later to low scrubby forest, which in contrast to the primeval forest, is singularly barren, even the usual thicket-dwellers more or less deserting it. Along the borders of the higher woods and about the rice-fields, however, there are often scattered trees or remnants of the older growth that attract many birds, either passing visitors from the nearest forest or those of more open country such as various hawks, rollers, bee-eaters, the common gray bulbul or "Pepper-bird," so familiar about the gardens and open tree growth. On large dead trees the little Brown Flycatchers (*Artomyias*) find suitable perches, Golden Cuckoos watch from neighboring tree tops and the small blackish swallows (*Psalidoprocne*) are common, skimming over the fields and clearings. The presence of native villages still further affects the species that delight in the vicinity of habitations. These are often conspicuous for their tameness and universal presence, evidently deriving some benefit in food, protection, or appropriate nesting-sites through human interference. Nearly every village large or small has its colony of Hooded Weavers (*Hyphantornis cucullatus*) in the oil-palm or silk-cotton tree in its midst, Thatch birds (*Spermestes cucullatus*) build their nests familiarly in the thick masses of roofing thatch of the huts, Long-tailed Wydahs (*Vidua macroura*) and an occasional Yellow-naped Weaver (*Penthetriopsis*) hop or walk about among the scattered grasses and weeds on the edges of the villages, while the blue and white Garden Kingfishers (*Halcyon senegalensis fuscopileus*) perch on nearby dead limbs or even on the roofs of the houses themselves. Nearly every native village has a pair of Black and White Shrikes (*Lanius collaris smithii*) on its outskirts, while Kites (*Milvus migrans parasitus*) and other hawks as the Harrier Hawk (*Gymnogenys typicus pectoralis*) and especially the black and white *Gypohierax angolensis,* seem commoner as hangers-on in the open country about villages. The tilling and planting of the soil to crops of rice and manioc favor the increase of a number of species which would otherwise be largely absent. In the rice-fields especially the small Grass Warblers abound, and in the eastern part of the country the Long-tailed Black Weavers (*Coliostruthus concolor*) build their nests in the longer grain-stalks. The beautiful rosy Fire Finches (*Lagonosticta*) also haunt the edges of rice-fields and a host of weavers of several species resort to them for food to the dismay of the natives who during the ripening season are much in the fields in their efforts to drive the marauding flocks away. Nearly every rice-field also harbors a pair or more of Two-spurred Francolins whose guineafowl-like calls may be heard in the early hours of the day. On the coast the little Button Quail (*Turnix sylvatica alleni*) has been taken in old plantations of manioc. All these species are birds that would not be found over much of Liberia were it not that human agency in clearing the land and bringing about different conditions of plant growth makes it possible for those birds characteristic of such formations to come in and take the place of the forest types that have been forced to withdraw.

In some places we noticed that small swamps formed where the vicinity of little brooks had been cleared and these seemed quite barren of bird life. Open swampy places, which in our own temperate climate would be a refuge for Swamp Sparrows, Song Sparrows, Yellowthroats, Marsh Wrens, Red-winged Blackbirds, or similar swamp-loving birds, were to all appearances quite unpeopled. This we supposed to be either because no swamp-living birds had found these places so that none had moved in, or they may have been more or less unlivable for the intense steaming heat where the tropical sun beats mercilessly down upon the moist grassy covering of the swamp.

Migrants from Europe

Liberia seems to lie somewhat outside the path of species migrating from the northern countries to central or southern Africa for the winter. The few that do appear with regularity are the common European Swallow and the Yellow Wagtail, both of which winter. Others are less common and probably reach Liberia in small numbers or irregularly, while the bulk of the southward flight passes to the east, avoiding the forested areas. Of such are the European Cuckoo (*Cuculus canorus*), the Great Spotted Cuckoo (*Clamator glandarius*), the European Swift (*Apus apus*), the Winchat (*Saxicola rubetra*) and such European warblers as the Garden Warbler, Willow Warbler, Reed Warbler, and the Spotted Flycatcher (*Muscicapa striata*). The Honey Buzzard (*Pernis apivorus*) and the Pale Harrier (*Circus macrourus*) are birds that in winter just reach the open country in the northern part of Liberia. Coastwise, several species of shorebirds pass along the Liberian shore to winter in the south of Africa. Among these are the European Ringed Plover (*Charadrius hiaticula*), the Kentish Plover (*C. alexandrinus*), the Gray Plover (*Squatarola squatarola*), the Greenshank (*Tringa nebularia*), the Whimbrel (*Numenius phaeopus*), and a few species of sandpiper, including an occasional Turnstone (*Arenaria interpres*), the Curlew Sandpiper (*Erolia testacea*), and the Common Sandpiper (*Actitis hypoleucos*). The presence of these species is more or less conditioned by the occurrence of suitable areas of tidal flats or sand banks exposed at the mouths of rivers. The region about Fisherman Lake and Cape Mount was found especially favorable for such shore-loving species by Büttikofer.

Of species more strictly confined to the open sea, there is a single record for the Red Phalarope (*Phalaropus fulicarius*) but the species is undoubtedly of regular occurrence offshore as a wintering bird for on our return trip by steamer from Liberia to London, numbers were seen in early November at no great distance north of the Liberian coasts. Of special interest, too, are the records of Stormy Petrel (*Hydrobates pelagicus*) and Leach's Petrel (*Oceanodroma leucorrhoa*), both of which breed in the North Atlantic and in winter wander to an unknown distance southward, while the Wilson's Petrel (*Oceanites oceanicus*), conversely, is common off the Liberian coasts in the summer months as a wanderer from the Antarctic Ocean. The Common Tern (*Sterna hirundo*) and the Sandwich Tern (*S. sandvicensis*) occur in varying numbers as visitors from the north along the coasts and probably also the Parasitic Jaeger will be found to be of regular occurrence as a wintering species and sometimes as a summer bird in the case of immature individuals.

Local Migrations

Among the strictly African species there are a few which seem to leave Liberia more or less regularly during the time when the heaviest rains come on, and return again to breed later in the season. Such is the White-throated Bee-eater (*Aërops albicollis*) which in Liberia as well as in Sierra Leone is absent during the summer months but returns about the last of October after the rains have abated somewhat and the drier season sets in. Apparently a similar disappearance is characteristic of the nighthawks for in the course of our stay which included the wettest months from July to November, no sign of the Long-tailed species (*Scotornis climacurus*) could be discovered though at other times it is known to be common, while the Pennant-winged and the Standard-winged species will probably be found to occur at suitable localities for they are well known at no very great distance from the borders of Liberia on the east and north. The two species of rollers we saw almost nothing of, though at proper seasons Büttikofer found them in hundreds hawking for insects. They probably make short migrations to other parts during the height of the rainy season. In all these cases it is quite likely that the torrential and often continuous rains tend to keep down the numbers of flying insects as well as to render the ground too wet for such species as habitually nest and rest upon it. These birds therefore remove to more favorable localities for part of the year, and in general, many of the native species do not commence nesting until the rains abate.

Probably there is more or less irregularity in the movements of some of the colonial weaver birds that come and go according to the presence of abundant food or the need for proper nesting areas. Of their local migrations we learned very little, however. The blossoming and fruiting of various forest trees at different seasons no doubt has a certain effect in concentrating temporarily various species of sun-birds or of fruit-eating pigeons, hornbills, and others that are attracted by the abundance of their favorite food. The ripening of the fruit of the oil palms also brings many of the larger species to feed on the rich pulpy rind.

The casual occurrence of many species is always to be expected, and we find a number of birds recorded which are evidently of infrequent appearance, among them the Flamingo, and Forbes' Three-banded Plover (*Afroxyechus forbesi*).

On the other hand probably some species regularly visit Liberia at seasons of the year when conditions favor them. Of such is the Senegal Plover (*Stephanibyx lugubris*) which according to Büttikofer regularly visits the more open places of the Cape Mount region in December and January.

It will be interesting, as more data become available, to trace the changes in the avifauna from the forest region northward and eastward toward the areas of lesser rainfall until the more open and grass-grown portions of the interior are reached. Many species of birds seem to reach their limits of distribution in southern Sierra Leone, approaching but seldom, if ever, crossing the Liberian border. Thus we saw at Freetown in that country numbers of vultures (*Necrosyrtes monachus*) but they are unknown in Liberia, nor are there any species of bustards or cranes, more typical of the open country. A comparison of our list with those of Kemp and Thompson for Sierra Leone reveals many other differences indicative of a change in the nature of the country and of the avifauna.

PROCELLARIIFORMES

PROCELLARIIDAE Petrels and Shearwaters

Hydrobates pelagicus (Linné). Storm Petrel

Procellaria pelagica Linné, Syst. Nat., ed. 10, vol. 1, p. 131: Sweden.

Length 6.5 inches; above blackish, with a white rump patch; below browner, with a small white area on the under wing-coverts, and with the axillaries tipped with white. Eastern Atlantic.

This small petrel breeds in the eastern North Atlantic, but after the nesting season wanders far over the ocean. Hitherto the only record for this bird in Liberian waters is that of Lowe who secured one that came aboard his ship thirty miles north of the equator on December 19, 1910 (Bannerman, 1912). A second record may now be added, namely, of an adult female secured by Loring Whitman on November 22, 1926. The bird came aboard the ship at night off Cape Palmas, Liberia.

Oceanodroma leucorhoa leucorhoa (Vieillot). Leach's Petrel

Procellaria leucorhoa Vieillot, Nouv. Dict. d'Hist. Nat., vol. 25, p. 422, 1817: Picardy, France.

In general coloration resembling the preceding species, size slightly greater; the relatively short legs do not extend beyond the tail in flight. Northern North Atlantic and North Pacific.

Although well known in its nesting grounds on the coastwise islands of the North Atlantic, the whereabouts of the species after the nesting season is very imperfectly made out. Of special interest therefore is the single Liberian record of a female captured at night on March 5, 1911, in latitude 6° 33′ north, longitude 12° 4′ west, which is off the coast opposite Monrovia (Bannerman, 1912). Lowe who secured the specimen, says that its stomach contained a fish; both this and Wilson's Petrel would sometimes settle on the poop of his vessel at night, attracted by the light on his table, and were easily caught.

Oceanites oceanicus oceanicus (Kuhl). Wilson's Petrel

Procellaria oceanica Kuhl, Beitr. z. Zool., vol. 1, p. 136, 1829: South Atlantic off Rio de la Plata.

A small species, blackish brown above, with a white rump patch; below similarly dark; the long legs project slightly beyond the tail in flight and their webs are yellow.

This ocean wanderer breeds in the subantarctic islands and in the non-breeding period (the northern summer), is common in the North Atlantic, usually well offshore. On our voyage to Liberia, we were attended by varying numbers of these birds almost daily all the way from the Bay of Biscay to the Liberian coast in the first week of July. Again, on the return voyage in November, a few were seen as far as Cape Verde, but at this date most of them were perhaps on their way to the breeding grounds on the islands of the Southern Ocean. Single birds that I watched, would beat back and forth not far astern, and on reaching the outer edge of our wake would wheel to cross it again, almost always using their feet to paddle momentarily on the surface to assist in making the turn. At times they seemed to pick up some small object forced up from deeper levels by the screw; at other times some more conspicuous object would attract one's attention, and in a moment a number would gather around it, hovering like so many butterflies with their feet patting the surface. As the days became somewhat oppressively hot under the tropical sun, it seemed to me that the numbers of petrels became distinctly less in the warmer hours of the day, when possibly many of the birds may have been resting on the surface of the sea. One that I watched, at length flew far off to one side of the steamer and twice alighted on the water, sitting high like a miniature gull, but at other times I never saw one on the surface resting. Lowe secured a male on January 20, 1911, that came aboard his vessel off Nana Kru, Liberia, attracted by the light at night (Bannerman, 1912). Since this is the season when these birds should be nesting it may be that a certain number, immature or barren birds, do not go to the antarctic islands with the main body, but remain in more equable climes.

No doubt certain of the shearwaters will be found to occur off the Liberian coasts, but records are lacking.

PELECANIFORMES

PHALACROCORACIDAE Cormorants

Phalacrocorax africanus africanus (Gmelin). Long-tailed Cormorant

Pelecanus africanus Gmelin, Syst. Nat., ed. 13, vol. 1, pt. 2, p. 577, 1789: Africa.

Length about 22 inches; black, the upper back, shoulders, and wing coverts more or less grayish brown; bill yellow, its ridge brown. Tail more than two-thirds the length of wing. Most of Africa, south of the Sahara.

Since it lives on fish, this is a frequenter of streams. Büttikofer (1885) regarded it as "tolerably common" along rivers and creeks, generally perching on low trees. Chubb (1905) records a specimen from Boporo on the St. Paul's River. At our camp on the Du we occasionally saw a single bird following the stream or swinging wide over the cleared area near.

ANHINGIDAE Darters

Anhinga rufa rufa Lacépède and Daudin. African Darter

Plotus rufus Lacépède and Daudin, in Buffon's Hist. Nat., 18 mo, Didot ed., oiseaux, vol. 17, p. 81, 1802: Senegal.

A slender, long-necked species, length about 35 inches; crown, neck, and throat dark brown, a white band on cheeks and sides of neck, a shorter one on chin; a white spot at base of jaw; elsewhere black with greenish reflections. Africa south of the Sahara.

Like the Cormorant this is a frequenter of streams, in which it secures its prey — fish. Büttikofer, who made extensive explorations of the rivers and creeks about Cape Mount, found it there throughout the year, as well as on the lower courses of the Junk. Possibly it is less common along the smaller swifter streams of the interior for we did not identify it.

CICONIIFORMES

ARDEIDAE Herons

Casmerodius albus melanorhynchos (Wagler). African Great White Egret

Ardea melanorhynchos Wagler, Syst. Av., additamenta, last p., 1827: Senegambia.

Length about 39 inches; entire plumage white, with ornamental plumes on back. Bill and eye yellow, feet black, loreal region bright greenish blue. Africa.

This egret seems to be not uncommon along the larger streams and lagoons near the coast. Büttikofer (1885, 1886, 1888) noted it at Fisherman Lake, Cape Mount, as well as on the lower Junk and Mesurado rivers. We did not meet with it in the interior.

Melanophox ardesiaca (Wagler). Black Heron

Ardea ardesiaca Wagler, Syst. Av., Ardea, no. 20, 1827: Senegambia.

A small heron, length about 20 inches; plumage slaty black; bill and tarsus black, toes yellow; iris yellow. Africa south of the Sahara.

Büttikofer mentions seeing this heron singly or in pairs along creeks and rivulets in marshy places and Bannerman (1912) records that Lowe found it at Settra Kru on the coast.

Demigretta gularis (Bosc). West African Reef Heron

Ardea gularis Bosc, Act. Soc. Hist. Nat. Paris, vol. 1, p. 4, pl. 2, 1792.

Length about 20 inches; slaty black or gray, with a white throat; ornamental plumes on back; bill horn to black, tarsus black, toes yellow. West African coastal region from Senegal to Gaboon.

This heron is locally common as at Fisherman Lake, Cape Mount, where Büttikofer (1885) found it abundant in the mangroves or fishing in backwaters left by the retreating tide. Away from the mangrove swamps, however, it is less common, for the same author (1888) only once met with it on a trip along the Barguay River, and we did not identify it in the interior. Stampfli collected two on the Junk River, where again, it was probably a frequenter of the mangroves.

Butorides striatus atricapillus (Afzelius). African Green-backed Heron

Ardea atricapilla Afzelius, Kongl. Vet. Akad. Nya Handl., Stockholm, vol. 25, p. 264, 1804: Sierra Leone.

Size and general appearance of a Green Heron, but crown and nape black, throat and neck gray with a whitish stripe; a white-bordered black stripe on side of head; back steely green; below gray to grayish white. Tropical Africa.

In the mangrove swamps along the coastal area this is a plentiful species, breeding in little colonies of from eight to fifteen pairs (Büttikofer, 1885, p. 239) but along the streams of the interior it is less often found. Indeed, the only ones we saw were near the mouth of the Mesurado, among the larger mangroves. Büttikofer notes its habit of climbing up and down the mangrove roots and branches, and its fondness for sitting in shadowy places on old floating logs. The food, he says, consists in part of crabs and small mollusks, but especially of the peculiar small fish known as the "big-eye bompy" (*Periophthalmus koelreuteri*). The eggs, two, sometimes three in number, are laid in October after the rains begin to abate.

Nycticorax leuconotus (Wagler). White-backed Night Heron

Ardea leuconotus Wagler, Syst. Av., Ardea, no. 33, p. 189, 1827: Senegambia.

Head and pointed neck feathers black; a stripe under eye, the center of back, and center of throat white; neck reddish brown and gray; wing-coverts, rump, and tail gray brown; wings gray; below streaked gray-brown and white. Africa south of the Sahara to the Zambesi.

Büttikofer (1885) speaks of collecting this heron at Fisherman Lake, Cape Mount, and Stampfli obtained one on the Junk River. On November 20, two very young birds were brought to Loring Whitman at Monrovia. We did not notice it away from the swamps and lagoons of the immediate coast. Chubb (1906) includes the common Night Heron, *Nycticorax nycticorax*, in his list of Liberian birds, probably based on the old record of Schweitzer, but although it may occur, for it breeds over much of Africa, the specimen if in existence should be reidentified.

Tigriornis leucolopha (Jardine). White-crested Bittern

Tigrisoma leucolopha Jardine, Ann. Mag. Nat. Hist., ser. 1, vol. 17, p. 86, 1846: Old Calabar.

Size medium, general color fulvous, broadly barred on head, neck, scapulars, and wing-coverts with greenish black, wing feathers black tipped with white; back, upper tail-coverts, and tail black. Head with a white crest. West Africa from Sierra Leone to the Congo.

This seems to be a rather uncommon species. Büttikofer found it at Fisherman Lake, Cape Mount, on both his visits there, and mentions its loud booming heard especially at night, a noise attributed by the natives to a large snake or a crocodile! Two were collected at some distance up the Du River by the same naturalist, who found them sitting in trees close to the river bank. They nest in October after the rains abate, for Stampfli secured a nestling on the Junk River in November; while in Sierra Leone, at Rotifunk, Kemp (1905) found downy young in the same month.

Ixobrychus minutus payesii (Hartlaub). Red-necked Little Bittern

Ardea payesii Hartlaub (ex Verreaux), Journ. f. Orn., vol. 6, p. 42, 1858: Senegal, Casamanse.

A very small heron, length about 12 inches; male with crown, back, and tail blackish with a greenish sheen, sides of head and neck reddish brown, neck, sides, and belly and lesser wing-coverts ocher yellow, bend of wing reddish brown; an indistinct whitish line on either side of throat. Female with only the crown blackish, neck chestnut, the back reddish brown, belly with a few blackish streaks. Africa south of the Sahara.

Of this African race of the Little Bittern, there appears to be no previous record. It is here included on the basis of a female sent from Liberia by Rev. George Schwab who secured it together with other specimens during a visit to Liberia in 1928. The precise locality is not given. No doubt it breeds rarely in the country, for Reichenow found its nests on the Gold Coast.

Ardeirallus sturmii (Wagler). African Dwarf Bittern

Ardea sturmii Wagler, Syst. Av., Ardea, no. 37, 1827; Senegambia.

A small species, length about 13 inches; above, slaty gray; center of fore neck and the abdomen streaked with slaty on a pale yellowish ground, throat white with a slaty central streak; feet yellow, iris reddish. Africa south of the Sahara.

Büttikofer (1885) collected this species at Bendo near Fisherman Lake, and speaks of it as a very quiet bird, somewhat rare, and found only along freshwater pools and creeks in the high forest. Lowe, however, secured one at Nana Kru, January 22, 1911, on the southern coast of Liberia, among the mangroves where it is difficult to see. We did not meet with it.

CICONIIDAE Storks

Dissoura episcopus microscelis (G. R. Gray). African Woolly-necked Stork

Ciconia microscelis G. R. Gray, Genera of Birds, vol. 3, p. 561, 1848; Africa.

Size medium, length about 24 inches; body chiefly black, the belly white; crown black, occiput and upper neck with short woolly white feathers; bill red and black, legs black, iris red. Africa south of the Sahara.

This is the only stork recorded for Liberia, and it seems rare along the coast. Büttikofer secured a specimen at Buluma, near Cape Mount, and notes that he saw it only now and then along the shores of Fisherman Lake.

THRESKIORNITHIDAE Ibises

Hagedashia hagedash guineensis Neumann. West African Hadada

Hagedashia hagedash guineensis Neumann, Ornis, vol. 13, p. 194, 1909: Ogruga, Nigeria.

Length about 18 inches; head and neck grayish brown, a whitish band on side of face; back olive brown with metallic reflections, tail and its coverts black, wings black with iridescence; bill black, reddish at base, feet dark red.

This ibis seems to be rare in Liberia, with but three actual records: the first is that of Büttikofer (1885, p. 242) who met with a small flock of six near Buluma, on a grassy plain with occasional shallow pools, and secured one of the birds; the second is of a male bird taken by Stampfli on the Du River (Büttikofer, 1889, p. 127); and the third is an adult female reported by Chubb (1905), collected on the St. Paul's River.

Lampribis splendida Salvadori. Liberian Green Ibis

Lampribis splendida Salvadori, Ibis, ser. 8, vol. 3, p. 185, 1903: Liberia.

Frontal shield at base of culmen broadly rounded posteriorly; brown, with a bronze luster, tail dark bluish green, primaries black, bill red, feet greenish flesh color.

This plain-colored bird with its long bill and pink legs is common in Liberia. We saw several small flocks on the Du River and Büttikofer also notes its presence there. It seems to prefer the wooded streams and perches freely in trees over the water. Büttikofer found it on the St. Paul's, the Du, and the Farmington rivers, and speaks of its habit of roosting at night in the high silk-cotton trees along the banks, coming in shortly after sunset, often making a "most horrible noise, consisting of long, training notes something like 'wah-wah, wah-wah'." Apparently the species is to be found, much of the year, at least, in small flocks up to a dozen individuals. This is the ibis called *olivacea* by Büttikofer and it may eventually prove to be a race of that species.

PHOENICOPTERIDAE Flamingos

Phoenicopterus ruber antiquorum Temminck. Greater Flamingo

Phoenicopterus antiquorum Temminck, Man. d'Ornith., ed. 2, vol. 2, p. 587, 1820: Europe.

Length 45 inches, white with a rosy suffusion, wing feathers black; bill pink at base, black at tip; the long legs rose red; feet webbed.

Büttikofer (1885, p. 246) records that one was shot at Robertport by an American missionary, Bishop Penick, who unfortunately did not preserve it, so that its specific identity cannot be fully established. It is a straggler from outside the forest area, and no doubt occasionally visits the country, for Sir Harry Johnston (1906) mentions that a Mr. Braham informed him that it sometimes visits Fisherman Lake in numbers.

ANSERIFORMES

ANATIDAE Ducks

Pteronetta hartlaubii (Cassin). Hartlaub's Duck

Querquedula hartlaubii Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 175: Camma River, Gaboon, West Africa.

Length 22 inches; chestnut, with blue wings, black head and neck, and white crown, not sharply defined; sexes alike.

This is a forest-dwelling species, confined to the West African forest area. In Liberia it is uncommon and perhaps here and in Sierra Leone at the northwestern limit of its range. Büttikofer found it only in a forest of high mangroves and other trees at the head of the Junk River, near Old Field. Here he frequently saw two or more birds perched on overhanging branches and once a pair swimming. His associate, Stampfli, on a second journey secured a bird at the same place, while more recently, Chubb has recorded a male from eastern Liberia. In all our journey across Liberia and back we met with the species but once. This was on a small creek running into the Junk River, where amid beautiful forest growth partly inundated during the rains, we nearly ran down a bird swimming ahead of the launch July 13. When the boat was stopped the bird arose and settled a short distance away when one of the party shot at it ineffectually. Instead of departing at once it flew about fifty yards and again alighted. A second shot finally alarmed it sufficiently to send it off beyond a turn of the stream and it was not seen again. We were told that the bird had been seen at the same place several times previously. It is therefore interesting to notice both the very localized habitat and the unsuspicious behavior of the bird, the latter trait in contrast to its wildness in the Congo, where according to Chapin, it may be exceedingly wary.

Dendrocygna viduata (Linné). White-faced Tree Duck

Anas viduata Linné, Syst. Nat., ed. 12, vol. 1, p. 205, 1766: Cartagena, Venezuela.

Length 20 inches; fore part of head, chin and spot in middle of throat white, back of head, neck, wings, lower back, rump, tail-coverts black; side buff barred with black, lower neck chestnut, back brown; center of lower side and feet gray. Africa south of the Sahara and South America.

We secured no specimens of this duck, but a pair seen circling once or twice about a large tree on the Du River, was probably of this species. Büttikofer (1885, p. 249) obtained specimens near Cape Mount on the sand banks and islets at the mouths of rivers, where in pairs or in small flocks of three or four pairs together, they came to feed. He found them exceedingly wary and never saw them perching in trees or among the mangroves. On September 9, a male was brought to him by a native who said he had caught it on a nest containing seven eggs, which later Büttikofer was shown, in dry grass under some shrubs near the mouth of Grand Cape Mount River. On August 16, seven downy young were caught on a grassy plain near the seacoast. In southeastern Sierra Leone, at Rotifunk, it was found plentifully by Kemp (1905).

Sarkidiornis melanonotus (Pennant). Comb or Knob-billed Duck

Anser melanonotus Pennant, Ind. Zool., p. 12, pl. 11, 1769: Ceylon.

Size large, about 29 inches long; head and upper neck whitish with black spots, lower neck and breast white; back and wings black with iridescence, tail gray. Female similar but paler. Male with a large knob-like excrescence on the base of upper bill. Africa south of the Sahara, and in India.

The only record is that of Büttikofer (1885) who writes that he many times observed this species in pairs or small parties up to five birds on sand banks at the mouth of the Sugary River, but was never able to come within gunshot of them. They are probably rare over much of the country.

Plectropterus gambensis gambensis (Linné). Spur-winged Goose

Anas gambensis Linné, Syst. Nat., ed. 12, vol. 1, p. 195, 1766: Gambia.

Size of a goose, wing with a sharp spur at the bend, in the male; black with steely reflections; more or less white on sides of head, throat, breast, belly, and at the bend of the wing; female similar but smaller. Africa south of the Sahara, except Madagascar.

This must be an uncommon bird in Liberia. We did not identify it, nor did Büttikofer observe it "in the wild state," although a female was taken by his companion Sala, near Fisherman Lake, Cape Mount, and in mid-November nine of a brood of eleven ducklings some three weeks old, were brought to him, taken in the Marfa River. Evidently it prefers somewhat more open country, for in the interior of Sierra Leone, Thompson (1925, p. 67) found it plentiful "wherever low, flat grass-fields and flooded ground occur."

FALCONIFORMES

FALCONIDAE

Aviceda cuculoides cuculoides Swainson. West African Cuckoo-falcon

Aviceda cuculoides Swainson, Birds W. Africa, vol. 1, p. 104, pl. 1, 1837: West Africa.

Length about 15 inches; body and wings above slaty black, neck brown with white feather-bases; upper tail-coverts banded black and white; sides of head and the fore neck gray; below white, broadly banded on the breast with rusty and on flanks with slaty; belly white; tail black with gray cross-bands and a white tip. Cere, feet, and iris yellow. West Africa from Gambia to Angola.

We did not see this falcon, and it probably avoids the forested parts of the country in general for Lowe found it "tolerably common but extremely shy" on the southern coast at Nana Kru, where he secured a male, January 22, 1911. There are but three other records of it: Büttikofer saw one pair at Buluma, Fisherman Lake, on an abandoned plantation and secured the male (1885); Stampfli collected a female on the Junk River (Büttikofer 1886, p. 247); and later one was collected at Schieffelinsville (Büttikofer, 1888, p. 66).

Milvus migrans parasitus (Daudin). African Black Kite

Falco parasitus Daudin, Traité d'Ornith., vol. 2, p. 150, 1800: South Africa.

A medium-sized species, with long wings, and a long notched tail, length about 22 inches; general color dark reddish brown, the feathers with blackish central streaks; sides of head and throat whitish, tail and wings indistinctly cross-banded. Africa and Madagascar.

Büttikofer (1885, p. 155) regarded this as the commonest bird of prey in Liberia, nesting in silk-cotton trees along large rivers, especially in open country near the coast, all the way to Cape Palmas. He records (1886, p. 247) a specimen from the Junk River, the stomach of which contained grasshoppers. Lowe also speaks of it as common along the coast. He secured a male at Nifu and noted them coming to a grass fire. Apparently it avoids the area of heavy forest in the interior for we saw nothing of it in our traverse of the country until nearly back to the coast at Moylakwelli, on the St. Paul's River where a lone bird, descending by a series of downward sweeps, came to alight on one of the tall silk-cotton trees by the village. From here back to the coast there was a pair at almost every considerable town. Compared with the East African representative of this species, the Liberian birds were much more wary, seldom coming within gunshot, and lacking the boldness of their eastern relatives which so frequently swoop down to pick up bits of meat almost at one's feet. At Suen we saw three kites which perched at times in a large silk-cotton tree in the midst of the village, but did not appear to disturb the large colony of Black and Yellow Weaver-birds in it. About the city of Monrovia we did not see kites.

Elanus caeruleus caeruleus (Desfontaines). Black-shouldered Kite

Falco caeruleus Desfontaines Hist. (Mém.) Acad. Roy. Paris, for 1787, p. 503, 1789: near Algiers.

A small hawk, blue-gray above, the region of the bend of the wing black; outer tail-feathers white; below pure white; feet feathered nearly two-thirds the distance to the toes which are yellow; cere yellow, culmen black, iris red. Africa, east to India and Yunnan.

Although this wide-ranging species is found over most of Africa, it has not hitherto been reported from Liberia, since it probably avoids heavily-forested country. In eastern Liberia we secured a single adult female at Gbanga on September 8. Here in somewhat cleared regions it is probably of more regular occurrence, while still farther to the eastward beyond the high forest it is frequent in Sierra Leone (Rotifunk) and common at Freetown on the coast according to Kemp (1905).

Machaerhamphus anderssoni (Gurney). Bat-eating Falcon

Stringonyx anderssoni Gurney, Proc. Zool. Soc. London, 1865, p. 618: Otjimbinque, Damaraland.

Smallish, about 17 inches long; color in general blackish with a slightly grayish wash, bases of neck feathers white, throat white with blackish central streak; rump and under tail-coverts white, the latter with dark tips; tail narrowly tipped with white, cross-banded below; bill short and weak. Africa.

Büttikofer (1889) includes this species in the list of Liberian birds on the authority of Schweitzer. It is a rare hawk of crepuscular habits, preying upon bats.

Pernis apivorus apivorus (Linné). Honey Buzzard

Falco apivorus Linné, Syst. Nat., ed. 10, vol. 1, p. 91, 1758: (Sweden).

Length about 24 inches; head gray, rest of upper parts brown, the feathers often white-edged; below white, spotted, streaked or banded with brown; wing-feathers gray brown, broadly tipped with blackish, and a band of same across the middle of the primaries; tail brown, with whitish base, pale edges to the feathers, and a subterminal dark band. Winters south to Angola and Natal.

There are two records of this more northern-breeding species, indicating probably that it occurs as an uncommon migrant in winter or as a winter resident. These are: an adult male killed January 1, on the Junk River by Stampfli (Büttikofer, 1886, p. 247), and an adult female taken by the same collector at Mt. Olive (Büttikofer, 1889, p. 115). The stomach of the first specimen contained fish bones and hair.

Stephanoaëtus coronatus (Linné). Crowned Hawk-eagle

Falco coronatus Linné, Syst. Nat., ed. 12, vol. 1, p. 124, 1766; Guinea.

A large eagle-like species, about three feet long; above blackish, the upper tail-coverts edged and banded with white, sides of head and neck brown; below white, tinged with rusty and banded with black, the feathers of the leg speckled with same, wings banded brown and black, tail banded with black and grayish brown; bill black, feet and iris yellow. Gold Coast and Uganda south to Cape Colony.

Under the name *Spizaetus bellicosus*, Büttikofer (1885, p. 152) records that a native hunter brought him a young bird of this species alive, that had been secured somewhere in the interior back of Robertport. The hunter had several times shot the species in the Gallinas country west of the Manna River. The only other record seems to be that of Chubb who identified as of this bird the feet of a large raptore secured in eastern Liberia by Pye-Smith. This eagle is well known to haunt heavy forest, building its nest in high and almost inaccessible trees; it feeds particularly on monkeys, and in this specialization of habit forms an interesting parallel to the American Harpy Eagle that preys on sloths.

Kaupifalco monogrammicus monogrammicus (Temminck). Northern Lizard-buzzard

Falco monogrammicus Temminck, Planches Color., livr. 53, pl. 314, 1824; Senegal.

Small, length about 14 inches; above gray, lores and a spot below the eye white; throat white with dark central streak; throat pale gray; belly and feathers of the legs banded white and blackish gray; tail dark, its terminal third or fourth banded with white; wing feathers cross-banded with gray and dark brown; bill black, cere and feet orange. Africa from the Sahara to Cameroon and Uganda.

Büttikofer found this a very shy hawk, and records but three specimens: a female from Fisherman Lake, a second from Mt. Olive, and a third from Robertport. We did not identify it. In southeastern Sierra Leone, however, Kemp (1905) regarded it more common than Hartlaub's Hawk, which may indicate that it is a frequenter of more open country.

Dryotriorchis spectabilis spectabilis (Schlegel). Gold-Coast Serpent-eagle

Astur spectabilis Schlegel, Ned. Tijdschr. Dierk., vol. 1, p. 131, pl. 6, 1863: Gold Coast, St. George Elmina.

Size of a goshawk; adult dark brown to slaty above, white below, with a black streak on chin. Immature, dusky brown above, tail with several dark cross-bars; chest feathers with large, black tips; thighs barred black and white, central feathers of chin narrow, black. Feathers of sides of head elongated, tail proportionally very long. Liberia to Cameroons.

This rare hawk is confined to the forest area of the west coast of Africa. Büttikofer (1886, p. 246) was the first to record it from Liberia on the basis of a female shot on the Du River, December 22, by Stampfli and believed to be then the third known specimen. Later (1888) he secured a wounded bird at Schieffelinsville and kept it alive for some two months, feeding it on the bodies of birds, especially of weavers. In 1899, Oberholser recorded the ninth known specimen, a female shot by Currie in the forest near Mount Coffee. He notes that it was unsuspicious and was in the act of eating a green snake when killed. Coolidge and I secured a female in immature plumage on the Du River, August 15. As we were making our way up-stream in a large dugout, the bird flew from the forest on our left and alighted in the thickest part of a leafy bough overhanging a dark pool of the stream. We did not see other specimens, but in the dense forest growth which it haunts, it might easily escape notice.

Cuncuma vocifer (Daudin). African Sea-eagle

Falco vocifer Daudin, Traité d'Ornith., vol. 2, p. 65, 1800: Keurboom River, Cape Colony.

Large, length about 29 inches; head, breast, back, and tail, and the longer under tail-coverts white; wings, shoulders, rump black with steely reflections; belly, legs, and shorter under tail-coverts reddish brown; bill black, cere yellow, legs yellow or whitish gray. Africa south of the Sahara.

The only record for Liberia is that of Büttikofer who records one taken by Stampfli on the Junk River. Its stomach contained fish bones. Probably this loud-voiced bird avoids the forested areas to a large degree.

Gypohierax angolensis (Gmelin). Vulturine Sea-eagle

Falco angolensis Gmelin, Linné's Syst. Nat., ed. 13, vol. 1, pt. 1, p. 252, 1788: Angola.

A large hawk with secondaries, tail except tip, and the scapulars black; plumage elsewhere white. Naked skin around the eye flesh-color. West Africa, Gambia to Angola.

This is a conspicuous and well-distributed species in Liberia, haunting the streams and more open places, perching on large dead trees, or visiting the palm groves for the nuts of the oil palm. At times they are quite unsuspicious and allow one to walk past within a few yards. Büttikofer remarks that they feed on fish and oil-palm nuts; one we shot at Kakatown had in its stomach, among other unidentified material, the remains of a large locust.

Buteo auguralis Salvadori. Red-necked Buzzard

Buteo auguralis Salvadori, Atti Soc. Ital. Milano, vol. 8, p. 377, 1865: Abyssinia and Libyan desert.

Length about 19 inches; slaty gray above with white bases to the feathers; sides of head chestnut brown; throat white streaked with blackish; breast slaty washed with chestnut; rest of under parts white, with black spots on belly; upper tail-coverts reddish with dark cross-bands, tail reddish brown with narrow subterminal bar of black. Sudan and Abyssinia to the west coast, Angola and Gaboon.

The only record of this bird in Liberia is that of Bannerman (1912), who states that Lowe secured two in Sierra Leone and saw a pair at Nana Kru, on the southern coast of Liberia. He found them more common on the Gold Coast.

Accipiter hartlaubi hartlaubi (Verreaux). Hartlaub's Sparrow-hawk

Nisus hartlaubi Verreaux, in Hartlaub, Syst. Ornith. West Afr., p. 14, 1857: Portuguese Guinea.

Size of a Sharp-shin, blue-black above, longest upper tail-coverts white, outer tail-feather with several, inner feathers with three white bars, central pair black; throat and under tail-coverts white; breast, belly, and thighs gray, sides washed with chestnut. Feet, eye-ring, and cere orange. West Africa, Gambia to Togoland.

This beautiful little hawk was described by Sharpe (1888) as *Accipiter büttikoferi* on the basis of Büttikofer's Liberian specimens, but it was later found that an earlier name was available. It is a forest-haunter occasionally met with throughout the country. Büttikofer and Stampfli secured specimens from Soforé Place, Du River, Schieffelinsville and Mt. Olive and we procured it at Kakatown and near Boporo, where a female was shot high in a forest tree at an early hour. Its stomach was empty. The ovaries were well developed and one yolk was almost of full size on October 30. Kemp (1905) has recorded a female about ready to lay eggs, on May 5 at Bo, Sierra Leone, nearly a hundred miles east of the northeast boundary of Liberia, so that the breeding period may extend over a large part of the year.

Astur tachiro macroscelides Hartlaub. West African Goshawk

Astur macroscelides Hartlaub, Journ. f. Ornith., vol. 3, p. 354, 1855: Gold Coast.

Length about 18 inches; above dark slaty, grayer on neck, tinged with brownish on wings; middle tail-feathers with three white spots on inner vanes marking the quarters of its length. Throat gray, breast, belly, and thighs chestnut, the body barred with white. Cere, feet, and iris yellow.

A not uncommon hawk of open parts of the forest. A male taken in the forest near the Du River, July 24, had insects in its stomach. Büttikofer secured a number of specimens from the St. Paul's, Farmington and Du rivers. He speaks of seeing them in small family parties of from three to five birds in dense but not high forest. It is not as shy as most hawks. In southeastern Sierra Leone, Kemp (1905) secured two young in February and April.

Urotriorchis macrourus macrourus (Hartlaub). Long-tailed Hawk

Astur macrourus Hartlaub, Journ. f. Ornith., vol. 3, p. 353, 1855: Dabocrom, Gold Coast.

Length about 24 inches; general color slaty gray, paler on head, neck, and breast; throat, belly, under and upper tail-coverts white; tail black with white cross-bars and tip; cere and feet yellow. Female with the under surfaces reddish brown. Gold Coast to Gaboon.

The Long-tailed Hawk is included by Büttikofer in his list of Liberian birds as having been collected by Schweitzer, but the identity requires confirmation.

Circus macrourus (S. G. Gmelin). Pale Harrier

Accipiter macrourus S. G. Gmelin, Nouv. Comm. Acad. Petrop., vol. 15, p. 439, pls. 8, 9, 1871: Veronetz gouv. to Volga.

Length 17 inches; above pale blue-gray, cheeks and eyebrows white, upper tail-coverts white with gray bars; below white; middle tail-feathers gray, the others with white and gray cross-bands; female and immature male brownish; bill black, cere and feet yellow. Breeds in Europe and Asia, migrating in winter to Africa from Sudan and Gambia south to Cape Colony.

Probably most of Liberia is too covered with forest and thicket growth to be attractive to open-country birds such as harriers, hence this species is uncommon there and then only as a winter resident near the coast. The only record is that of Büttikofer (1885, p. 151) who secured two young males at Cape Mount in November.

Gymnogenys typicus pectoralis (Sharpe). West African Harrier-hawk

Polyboroides pectoralis Sharpe, Bull. Brit. Orn. Club, vol. 13, p. 50, 1903: Efulen, Cameroons.

Length 25 inches; adult blue-gray, belly, thighs, and upper tail-coverts barred black and white; tail black with two bars and tip white, speckled with brown; primaries black, secondaries gray with black tips; scapulars gray with a black subterminal spot. Neck-feathers elongated. Feet and the long tarsus yellow. Immature, a general dark brown, tail with three or four dark bars; thighs barred, yellowish or buff and dusky. The region around the eye is naked, and orange-colored. Portuguese Guinea to Cameroons.

This bare-faced hawk is frequently seen in Liberia, usually in pairs frequenting the vicinity of plantations and clearings, or soaring overhead. In its adult plumage of blue-gray with the ruff of long feathers around the back of the neck it is a handsome bird. Near our camp on the Du, a pair was frequently seen, one of the birds sometimes coming to the stumps still standing after the clearing of the forest, to watch for prey. They were wary, however, and seldom came within gunshot. At Paiata we saw another walking about on the ground as if in search of food, and it is not unlikely that they hunt about on the ground a good deal for their long legs are well suited for this. Indeed, our first specimen had been caught in a native ground-snare. One shot at Gbanga had in its stomach the remains of insects as well as kernels of the oil palm, doubtless swallowed for the oily pulp surrounding them; the other contained the remains of a large Mantis. Fischer mentions seeing one searching in the holes of a palm trunk and we saw a similar act at Gbanga where an adult bird worked its way up and around a large dead tree not far from our hut, examining hollow places as it went, and using both feet and wings to ascend. Kemp (1905), writing from Sierra Leone, makes the interesting observation that one he killed in February was "robbing, one after another, the nests of *Hyphantornis cucullatus* [the common Hooded Weaver] inserting its bill into each nest. While acting thus the Hawk is able to hover, without using its feet, after the manner of a Humming-bird." A female in immature dress that we secured at Gbanga, September 22, had the skin of the belly much thickened as if it were incubating. On October 24 and on the 27th a pair of these hawks was seen in what was no doubt a courtship performance. In one instance the pair was circling easily high over the village, one of them at frequent intervals taking a short sail on outspread wings then turning abruptly upward for a short distance, only to swing off a little to one side, take another short sail ending in a vertical sweep, continuing so for a number of minutes at a time. At another place a single bird was seen doing the same thing alone though its mate may have been in the vicinity but concealed from view.

GALLIFORMES

TURNICIDAE Button-quails

Turnix sylvatica alleni Mearns. Kurrichane Button-quail

Turnix sylvatica alleni Mearns, Smithsonian Misc. Coll., vol. 56, no. 20, p. 5, 1911: north of Mt. Kenya, northern Guaso Nyiro, Kenya Colony.

Like a small partridge, length 5 inches, no hind toe or stiff tail-feathers; above mottled olive, black and brown, the larger feathers barred black and chestnut, with white edges, breast ochraceous, belly and throat whitish buff. Africa in more open places.

Several of these small quails were shot on the Kru coast, Nana Kru, etc., by Lowe, in January, 1911, who says they were generally to be found among the cassava plantations on sandy soil (Bannerman, 1912). The species had not previously been recorded from Liberia. Sclater in his list of African birds refers these of the West Coast to the race occurring also in Uganda and Kenya Colony instead of to *T. s. lepurana* (type locality, western Transvaal) as Bannerman had done. Probably they are very locally distributed in Liberia.

PHASIANIDAE Pheasants

Francolinus lathami lathami Hartlaub. Latham's Francolin

Francolinus lathami Hartlaub, Journ. f. Ornith., vol. 2, p. 210, 1854: Sierra Leone.

Size of a partridge; throat and breast black, the latter with heart-shaped white spots on each feather; sides of head gray; back of neck chocolate, broadly streaked with white; back warm brown, feet pale yellow, bill black.

This little Francolin is a bird of the forest region from Senegambia to Loango Apparently uncommon and seldom seen, it appears not to be gregarious but is occasionally trapped by the natives in snares set at openings in a long fence of palm leaves and sticks made to intercept ground-living birds and small mammals.

The two specimens we obtained were captured by the natives in this way. Büttikofer secured them at several stations in the forest region, and mentions flushing a bird from its egg between the roots of a silk-cotton tree in the forest near Soforé Place. Near Schieffelinsville, Stampfli secured four young from a brood just hatched on February 6, as well as a series of adults from the Farmington River.

Francolinus bicalcaratus thornei Ogilvie-Grant. Sierra Leone Double-spurred Francolin

Francolinus thornei Ogilvie-Grant, Bull. Brit. Orn. Club, vol. 13, p. 22, 1902: Sierra Leone.

Size of a partridge; top of head brown bordered by black; eyebrow and throat white; feathers of back and wings finely variegated with whitish and dusky with dark centers, those of scapulars and wing-coverts bordered with white; feathers of neck and lower surfaces each with a median black area broadly bordered with buffy and edged with chestnut, the last becoming reduced ventrally; the black shaft area of ventral feathers with a double small white spot. Legs olive, with a double spur in the male.

Bannerman (1922) points out that this darker race of Sierra Leone and Liberia is replaced by the paler typical race to the north as well as to the south on the Gold Coast. Büttikofer does not mention the species although it is common in the plantations of eastern Liberia and along the Kru coast (Bannerman, 1912). Probably, however, he confused it with the following species, of which he says the adult male has two spurs. We first saw the bird at Memmeh Town where one was flushed in a cassava field, and thence eastward it was common in the cleared areas and rice plantations, often flushing in pairs or singles in the early morning or toward evening. Its note, sometimes given from a perch on some low stump or fallen tree, is much like the familiar *pot-rack* of a Guinea-fowl. They apparently avoid the forest almost altogether so that clearing of spaces for cultivation has probably been beneficial to the bird. The nesting season seems to be late in the year. Kemp (1905), writing of southeastern Sierra Leone, speaks of a female taken in late September that contained an egg, and adds that the nests are often found by the natives in December and January when they are gathering rice in the plantations; the number of eggs is always two. A male bird taken at Gbanga, Liberia, on September 18, we found to have the skin of the abdomen much thickened just as in an incubating bird, which may indicate that in this species the male takes part in the hatching of the eggs.

Francolinus ahantensis Temminck. Ahanta Francolin; "Guinea-fowl"

Francolinus ahantensis Temminck, Bijd. tot de Dierk., vol. 1, p. 49, pl. 14, 1854: Ahanta, Gold Coast.

Size of the last; above mottled brown, neck feathers darker, edged with white; throat and inconspicuous eye-stripe whitish buff; breast brown, each feather with a white stripe just back from its margin. Feet and bill orange; male with a single spur. Liberia to the Gold Coast.

This, like Latham's Francolin, is a bird of the forest, seldom visiting the cultivated areas. The two specimens we brought back were both trapped by the natives near Paiata, and Büttikofer (1885, p. 231) notes a specimen secured in high forest in the same way at Buluma. He obtained one also at Fisherman Lake, and mentions a pair from Mt. Olive, but these may all have been the preceding species, for he says the male was double-spurred. Oberholser received one from Mount Coffee. Thompson (1925) records a set of eggs taken December 29 in Sierra Leone.

Agelastes meleagrides Bonaparte. Turkey-like Guinea-fowl; White-necked Guinea-fowl

Agelastes meleagrides Bonaparte, Proc. Zool. Soc. London for 1849, p. 145, 1850: Gold Coast.

Length about 19 inches; head and neck unfeathered, rose-red, becoming white on the lower neck with a few white feathers; feathers of neck white all around, rest of plumage blackish, finely vermiculated with gray. Liberia to Gaboon.

This forest-haunting guinea-fowl proved to be an exceedingly elusive bird. In spite of special efforts, we did not secure a single specimen nor even see an individual. The natives occasionally snare one in nooses set at openings in a long barrier made of sticks and palm fronds in the forest, but they seem at all times rare and secretive in habits. Büttikofer on his first visit to the country secured a male at Soforé Place, where it was trapped by a native; later (1888) others were taken near Schieffelinsville and Stampfli was so fortunate as to obtain eight from the natives who trapped them near Mt. Gallilee. These "must have belonged to one large travelling flock, as they all were caught within one week, toward the end of July" (Büttikofer, 1889, p. 126). He kept them alive for a time and they became fairly tame. At first they would eat nothing but the larvae of *Termes mordax*. In addition to these records, Chubb (1905) notes one from St. Paul's River.

Guttera edouardi pallasi Stone. West African Crested Guinea-fowl

Guttera pallasi Stone, Auk, vol. 29, p. 208, 1912: West Africa.

Crest and neck feathers black, elsewhere finely speckled, each spot white with a bluish ring; wing feathers edged with blue, the longer ones with white. Bare skin of throat red, rest of head blackish. Sierra Leone to Togoland.

In spite of much search, our experience was like that of Büttikofer who found this a shy and secretive bird, and obtained specimens only with difficulty. The natives occasionally snare them or kill them while waiting for antelope in the forest. They occasionally come out of the forest to secluded rice fields to feed in early forenoon or before sunset, and it was in such a place that we startled a pair late one afternoon at Paiata. A woman who tended this rice field said that the birds had been coming daily. They rose from a small patch of weeds and rice and flew directly to the trees at the edge of the forest with feeble *cack cack* sounds. Following them I was able to come directly under the tree in which they perched. At times they are said to gather into small flocks. Büttikofer reported specimens from Bavia and Buluma, as well as from Hill Town and Mt. Olive. Chubb records one from St. Paul's River. Thompson (1925) regards it as common on the borders of forest and grasslands in the back country of Sierra Leone. The native name along the St. Paul's is Pleon.

GRUIFORMES

RALLIDAE Rails

Himantornis haematopus Hartlaub. Nkulengu Rail

Himantornis haematopus Hartlaub, Journ. f. Ornith., vol. 3, p. 357, 1855: Dabocrom, Gold Coast.

A large rail of a general dull olive brown, the edges of the feathers paler, those on the back with a blackish subterminal area; throat dull white. Bill horn color, feet carmine. West Africa, Liberia to Congo.

This large rail is apparently not rare in the wooded parts of Liberia. The only specimen we secured was trapped by a native at Paiata. Büttikofer and his associates, however, obtained several along the Junk and the Du as well as on the Farmington River. One of these was caught in the mangroves about 200 yards from their station at Schieffelinsville.

Two Cameroons specimens have slenderer bills and paler, more russet, outer sides to the primaries than our bird. Sclater has pointed out that if the Cameroons bird is really different, the name *H. h. petiti* (Oustalet) is available for it.

Canirallus oculeus oculeus (Hartlaub). Gray-throated Rail

Gallinula oculea Hartlaub, Journ. f. Ornith., vol. 3, p. 357, 1855: Rio Boutry, Gold Coast.

Chin and area about base of bill pale gray, throat and breast chestnut, belly drab, flanks barred with whitish; back olive brown, wing feathers blackish with large rounded white spots; short tail chestnut. Bill green at base, the tip gray. Liberia to Gold Coast.

This is a secretive bird of woody swamps and, like all rails, difficult to secure. The only specimen we obtained was brought in at Kolobanu, near the St. Paul's River, October 18. Büttikofer (1888) shot an adult male in a swampy inlet of the Du, near Hill Town, and later (1889) recorded three other adults from Mt. Olive and Mt. Gallilee.

Limnocorax flavirostra (Swainson). Black Crake; "Black Water-hen"

Gallinula flavirostra Swainson, Birds West Africa, vol. 2, p. 244, 1837: Senegal.

Length 8.5 inches; black, the body and wings shining brown washed with slaty; eye, eye ring, and feet red, bill yellowish green. West Africa, south of the Sahara.

This is probably a very local species. We heard nothing of it, and the only record is that of Büttikofer (1885, p. 245) who secured specimens near Robertport, where several pairs lived in a fresh-water swamp at the foot of Cape Mount. In September their loud calls were heard nightly, sounding much like those of the European Corn Crake. They were very shy and difficult to see. On November 15, three downy black young were brought to him there.

Sarothrura pulchra pulchra (Gray). White-spotted Crake

Crex pulchra J. E. Gray, Griffith's ed. Cuvier's Regne Anim., A ves, vol. 3, p. 410, fig., 1829: (Sierra Leone).

Length 6 inches; head, neck, shoulders, breast and tail reddish brown, throat paler; sides and wings black with round white spots; eye reddish, bill black or gray-green, feet reddish brown. Female has sides, wings, and tail black barred with rusty. West Africa, Gambia to Angola.

Another of this elusive group, found in low swampy forest. Büttikofer succeeded in procuring one at Hill Town, and two adults at Mt. Olive, while a fourth adult is recorded by Oberholser from Mount Coffee. There are no other instances.

HELIORNITHIDAE Finfoots

Podica senegalensis senegalensis (Vieillot). Smaller Finfoot

Heliornis senegalensis Vieillot, Nouv. Dict. d'Hist. Nat., vol. 14, p. 277, 1817: Senegal.

Slender-necked, length about 13 inches; above dull brownish, darker and with numerous small white spots across shoulders and base of wings; tail long, stiff, blackish with pale shafts; a narrow white stripe from eye along sides of neck; chin and breast white, lower neck finely speckled with darker, flanks and under tail-coverts barred brown and white; feet lobed, yellow, bill pale. West Africa.

This is a well-known and widely distributed species along the larger waterways of Liberia, penetrating also into the side streams and forest pools, usually solitary or occasionally two together. We started a number on the Du that splashed up in front of the launch about a gunshot away and sought the shelter of overhanging vegetation along the bank, flying very close to the surface of the water. As a rule they are extremely wary. One that I watched swam very low in the water with the back nearly awash, but saw me at the least move, sank under the surface and disappeared.

They evidently nest in the autumn, for on October 8 a downy young one was brought to us at Paiata, and on the 27th of the same month two others were brought in at Moylakwelli that were slightly more advanced with the tail-feathers partly grown. The prominent claw on the first digit of the wing was obvious in these little birds.

CHARADRIIFORMES

CHARADRIIDAE. Plovers and Sandpipers

Charadrius hiaticula hiaticula Linné. European Ringed Plover

Charadrius hiaticula Linné, Syst. Nat., ed. 10, vol. 1, p. 150, 1758: Sweden.

Small, 6 inches long; a black forehead band from eye to eye and another from base of bill to ear, cutting off a white band between them; chin, throat, and nape white forming a collar, then a broad black breast band continued to form a black collar above; crown, back, wings and upper tail-coverts olive gray, lower breast and belly and outer tail-feathers white; bill black-tipped, orange at base. Breeds on European coasts, winters south to west coast of Africa and the Cape.

This is a winter resident of the beaches and sand-banks near the coast. Büttikofer (1885, p. 237) collected specimens near Robertport, and on the banks at the mouth of the Marfa River where it arrives from the north in the month of October. Lowe found it at Nifu, December 30, 1910 (Bannerman, 1912).

Charadrius marginatus pallidus Strickland. West African White-fronted Sand-plover

Charadrius pallidus Strickland, Contr. Ornith., 1852, p. 158: Damaraland to Gold Coast.

Small, 5 inches long; base of bill to eyes white; line from angle of mouth to ear region and the forehead black; nape buff; rest of upper parts olive, the wings and tail darker brownish; a narrow white wing-bar; two outer tail-feathers white, third white with dark tip; lower surfaces white, washed with buff on breast. Bill and feet blackish.

The only record is that of Lowe who secured it at Nana Kru in January (Bannerman, 1912).

Charadrius alexandrinus alexandrinus Linné. Kentish Plover

Charadrius alexandrinus Linné, Syst. Nat., ed. 10, vol. 1, p. 150, 1758: Egypt.

Small, length 5 inches; a line across forehead over eye, and ring across neck white; line through eye from base of bill and a patch on each side of breast black; lower surfaces and outer tail-feathers white; legs black. Breeding in Europe and North Africa; south in winter from Senegambia to the Cape.

This seems to be an uncommon winter visitor on the seacoast. The only instance is that recorded by Büttikofer (1885, p. 237), who secured a young male in first autumnal plumage on the seashore near Robertport, on October 23.

Afroxyechus forbesi (Shelley). Forbes's Three-banded Plover

Aegialitis forbesi Shelley, Ibis, ser. 5, vol. 1, p. 560, pl. 14, 1883: Shonga on the Niger.

Small, length 4 inches; a crescent from base of bill to forehead, a narrow eyebrow stripe, and the upper tail-coverts white; throat grayish, below which are two black bands across chest, the rest of under parts white; wings blackish, the larger feathers with narrow white tips; central tail-feathers like back, others white with dark inner basal portion. Base of bill orange, tip black. West Africa from Senegambia to Cameroons.

The only record is again that of Büttikofer (1890, p. 206) who shot an adult female near the mouth of the Marfa River. It is doubtless of rare occurrence along the seashore.

Squatarola squatarola squatarola (Linné). Gray Plover

Tringa squatarola Linné, Syst. Nat., ed. 10, vol. 1, p. 149, 1758: Sweden.

Larger, length 7.5 inches; male with forehead and nape gray speckled with black; rest of upper parts black mottled with white, tail barred black and white; below from chin to abdomen deep black; belly, under tail-coverts, and lower surface of tail white. Female more speckled above; breast and throat streaked with dark brown on a white ground. In winter to the African coasts.

The common Gray Plover winters rarely on the Liberian coast. The only record seems to be that of Lowe, who collected a male at Nana Kru, January 24, 1911 (Bannerman, 1912, p. 257).

Stephanibyx lugubris (Lesson). Senegal Plover

Charadrius lugubris Lesson, Dict. des Sci. Nat., ed. Levrault, vol. 43, p. 36, 1826: [Senegal].

Length about 10 inches; back and wing-coverts olive brown, forehead and throat white, crown gray-brown; sides of head and neck pale gray becoming dark gray below; below white; middle tail-feathers white at base, black-tipped and narrowly edged with white, outer ones white with dark tips, outermost all white; outer wing-feathers black, inner white. Africa south of the Sahara.

This plover seems to visit cleared areas with some regularity, but there are no records of it beyond those of Büttikofer (under *Vanellus inornatus*). He collected specimens at Buluma, near Fisherman Lake, during December and January when it regularly visited newly made "farms" in small flocks of five to seven or ten. He found similar flocks in the savannas near Old Field after the grass had been burnt off. Others were recorded from Schieffelinsville.

Xiphidopterus albiceps (Gould). White-headed Plover

Vanellus albiceps Gould, Proc. Zool. Soc. London, 1834, p. 45: Quorra River (Niger), or Fernando Po.

Larger, length 13.5 inches; a pair of long triangular yellow lappets at base of bill; forehead, crown, and a ring about the neck white, as well as throat, middle of neck below, and the abdomen; back brown, rump white bordered with darker; tail white at base, black-tipped; three outer primaries black-tipped, others white. Feet yellow. From Liberia and the Sudan, south to the Zambesi.

Liberia seems to be about the northward limit of this bird's range in West Africa. It is interesting as a bird requiring particular conditions for its habitat, namely, rocky islets or sand-bars in rivers where the current is swift and hence it is an exceedingly local species. Chubb has recorded a specimen taken on the St. Paul's River, February 25, 1905, and Büttikofer (1885, p. 236) has recorded it from the same river. He writes: "On the St. Paul's there was only one spot where we ever saw them, and the same was the case with the bank mentioned in the Marfa River. The natives told me that they stay there for years and are never seen on other similarly situated spots in the same river . . . . The small colony in the St. Paul's River inhabited a rocky island between two rapids and was inaccessible to us." We did not meet with the species on the upper St. Paul's, where it might be that the varying height of the river in dry and rainy seasons would have more effect on their localized habitat.

Arenaria interpres interpres (Linné). Turnstone

Tringa interpres Linné, Syst. Nat., ed. 10, vol. 1, p. 148, 1758: Gothland.

Length 8 inches; male in spring, above mottled gray and dark brown on head, mottled black and chestnut on back; lower back and longest tail coverts white separated by a black area; wings and tail blackish, a prominent white wing-bar; chin, sides of breast and belly white, elsewhere black; feet red, bill black. Female with similar pattern but mottled brownish and white on head, back and breast. Breeds in arctic regions; South in winter to West African coasts, from Senegal to the Cape.

Like other shorebirds migrating to the African coasts in winter, this seems to be a scarce species on the Liberian coast. The only record is that of Lowe, who secured an adult female in the winter plumage, at Nifu, on December 30, 1910 (Bannerman, 1912, p. 257).

Erolia testacea (Pallas). Curlew Sandpiper

Tringa testacea Pallas, in Vroeg's Cat., Adumbrat., p. 6, 1764: Holland.

Length about 6 inches; bill slightly curved down; above, mottled black and ochraceous, rump and tail-coverts white, the latter with a few round dark spots; breast and throat chestnut, frosted with white, the larger feathers with dull subterminal bar; a small white wing-bar; belly white.

This arctic species migrates in autumn to African shores and was twice recorded by Büttikofer (1885, 1888): an immature bird was taken as early as September 30 at Cape Mount, where in common with other shore birds the species frequents river banks and the shores of brackish lagoons; a second was shot on a brackish lagoon on Barguay River.

Actitis hypoleucos (Linné). Common Sandpiper

Tringa hypoleucos Linné, Syst. Nat., ed. 10, vol. 1, p. 149, 1758: Sweden.

Length 6 inches; olive green above, the scapulars and wing-coverts finely barred with blackish and buff; below white, throat dusky at sides, its middle area finely streaked; an indistinct eye stripe, bill blackish, feet olive green.

This sandpiper will doubtless be found to occur at all seasons of the year, but those seen in summer are probably non-breeding birds. Büttikofer observed it throughout the year and secured various specimens. On the Du he met with single birds as far up as the falls as well as on all the other rivers visited. Lowe took a specimen at Subono and Chubb (1905) mentions specimens from eastern Liberia. We occasionally saw single individuals in suitable places along the larger streams or on the edges of brooks in open spots. An adult male taken on the Du, August 5, had very small testes. An adult female was shot October 11 at Paiata on the upper St. Paul's. Kemp (1905) records it from the interior of Sierra Leone.

Tringa nebularia (Gunnerus). Greenshank

Scolopax nebularius Gunnerus, in Leem, Beskr. Finm. Lapp., p. 251, 1767: Norway.

A large sandpiper, bill about 2 inches long, grayish brown above, wing-coverts and tertials edged with a series of dark spots; rump white; upper tail-coverts white, barred terminally with dusky; lower surfaces white (winter plumage); bill and feet grayish green. Europe, wintering in Africa, and eastern Asia.

Büttikofer (1885) found this one of the commonest wintering species of shorebird in Liberia, along the shores of Fisherman Lake, the Marfa River, and the Barguay River, but it apparently does not occur at any distance from the coast. In addition to birds, usually pairs, seen in October (probably first arrivals), he also found it present in December, January, and July, though in the latter case they must have been immature or non-breeding birds. On the Barguay River he found it in large flocks. Stampfli shot one October 29 on the Junk River, and Mr. M. A. Cheek presented us with one shot near Monrovia, November 6.

Numenius phaeopus phaeopus (Linné). Whimbrel

Scolopax phaeopus Linné, Syst. Nat., ed. 10, vol. 1, p. 146, 1758: Sweden.

Large, length about 20 inches, with long, down-curved bill; chin, rump, belly, and under tail-coverts white, back mottled dark brown and clay color, wings barred with whitish; throat and breast buff streaked with dark brown. South in winter throughout Africa.

This is the only curlew known to occur in Liberia, where it is a winter resident in suitable localities on the coast. We did not meet with it on the rivers inland, but Büttikofer (1885, 1888) found it common at Fisherman Lake and on the Marfa River wherever large sand banks are present, and again on the sand and mud banks of the Junk River at ebb tide. Although he adds that it is common throughout the year, it must be that the summering individuals are immature non-breeding birds. On the adjacent coasts of Sierra Leone, Thompson (1925) found it common during the winter months.

PHALAROPODIDAE Phalaropes

Phalaropus fulicarius (Linné). Red Phalarope

Tringa fulicaria Linné, Syst. Nat., ed. 10, vol. 1, p. 148, 1758: Hudson Bay.

Length about 7 inches, with slender bill and lobed feet; in spring, crown and wings blackish, back streaked black and ochraceous, rump gray; sides of head white, wings with a conspicuous white bar; below dull chestnut. Winter, mark through eye, crown and nape dark brown, back blue with a few dark feathers edged with ochraceous; below white, the throat washed with buff. Breeds in the arctic regions, winters in seas of southern hemisphere.

Chubb (1905) publishes the first definite record for Liberia on the basis of an adult male, without exact locality, taken March 23, 1905, by J. M. Pye-Smith. I have elsewhere recorded (Allen, 1927) that in early November I saw numbers of these birds at sea off Portuguese Guinea and Cape Blanco. There may be a large wintering ground of the species off this part of the African coast.

GLAREOLIDAE Pratincoles

Galachrysia nuchalis liberiae (Schlegel). Chestnut-collared Pratincole

Glareola nuchalis liberiae Schlegel, Notes Leyden Mus., vol. 3, p. 58, 1881: Liberia.

Length 7 inches, long winged; above dark grayish brown, paler on cheeks, fore neck, and breast; a narrow eyebrow line passing into the pale reddish-brown band marking off the frontal shield on breast; belly, upper and under tail-coverts white; middle tail-feathers black with white bases, outer ones mostly white, outermost with black tip and edge. Liberia to Cameroons.

Reichenow has shown that Oberholser's (1899) record of *Glareola marchei* from the St. Paul's River refers to this form, and it is the same as that called *G. megapoda* by Büttikofer. Like *Xiphidopterus*, this pratincole is closely limited in habitat to bare rocky islands or sand banks in the larger streams. The following is a summary of Büttikofer's very interesting notes on the species. He found them common near Bavia, St. Paul's River, on the many bare rocky islets and sand banks in the stream, but never on the banks of the river itself. Often, morning and evening, they were seen on the wing hawking over the water for insects. On March 15, he found them nesting on these islands, depositing one or two eggs in a hollow scratched in the hot sand near a bit of rock and quite without lining. In his later paper (1888, p. 99) he adds that he collected this bird at Fisherman Lake, as well as at the falls of the Du, and on the St. John's and Cestos rivers. On a succeeding visit to his old stations, Bendo and Buluma, on Fisherman Lake, he was anxious to see what had become of the small colony of these birds that he had formerly found on some mangrove-covered and bare rocks in the lake between these stations. He had never found more than eight birds here, and on this later visit found six. They seem to delight in the vicinity of falls, for he found a colony below the falls of the Du and again, on the St. John's River, he shot three on the rocks above the rapids. A large series was collected near the falls of the Farmington River; their stomachs were found to be filled with termites, probably from a swarm of flying ants. Chubb (1905) records four birds taken by Reynolds on the rocks of the St. Paul's River. He found them as usual confined to rocks in the stream, and notes that their "wings stand out at the shoulders and do not appear to rest close at the sides as in other birds." Lowe (Bannerman, 1912) seems to have found them in slightly different situations on the coast of southern Liberia for he noted that they were plentiful on the lagoons where as many as fifty or sixty were seen together. We did not meet with the species, but possibly the high water at the time of our visit may have restricted them to certain parts of the larger streams.

BURHINIDAE Thick-knees or Stone Curlews

Burhinus vermiculatus büttikoferi (Reichenow). West African Water Dikkop or Stone Curlew

Oedicnemus büttikoferi Reichenow, Orn. Monatsb., vol. 5, p. 182, 1898: Fisherman Lake, Liberia.

Length about 15 inches with short thick bill; above barred and on head streaked with blackish brown on a pale grayish-brown ground; a white band above and one below the eye; below white, streaked on sides with dark; iris yellow, feet greenish to blue-gray. Liberia to Eastern Uganda.

We obtained no evidence of this species in the interior of Liberia, but it seems to be common at times in favored localities on the coast. Büttikofer (1885, p. 232) collected two specimens near Cape Mount, the one at Buluma near Fisherman Lake in March, the other on a sand bank near the mouth of the Marfa River, August 18. It is found here only in the dry season when a large extent of sand flats is exposed in this region and the waters of the lake are somewhat brackish supporting small crustaceans upon which the birds feed. The same naturalist on his later visit secured it near Robertport on the seashore, and in southern Liberia, Lowe found it common on some of the lagoons, as well as occasionally on the coast, as at Nana Kru, December 31, 1910 (Bannerman, 1912).

JACANIDAE Jaçanas

Actophilornis africanus (Gmelin). African Jaçana or Lily-trotter

Parra africana Gmelin, Syst. Nat., ed. 13, vol. 1, pt. 2, p. 709, 1789: Abyssinia.

Rail-like with long toes, a spur at the bend of wing, and a forehead plate; length 10.5 inches; crown and neck shining blue-black; sides of head and neck white, throat shining yellow; body and tail reddish brown, wings black; bill and forehead plate blue-gray, feet paler. African continent.

The only record seems to be that of Sir Harry Johnston who collected a specimen at Grand Bassa, St. John's River, in 1888. It seems to be a bird of not very retiring habits so that it would probably have been well known to such careful collectors as Büttikofer and his associates if it were common in Liberia. In Sierra Leone Thompson (1925) found it common "up country," among water lilies and aquatic herbage of almost any large pond.

STERCORARIIDAE Jaegers

Stercorarius parasiticus (Linné). Parasitic Jaeger

Larus parasiticus Linné, Syst. Nat., ed. 10, vol. 1, p. 136, 1758: coasts of Sweden.

Gull-like, length about 20 inches; top of head, body above, wings and tail dark brown; edge of forehead, cheeks, sides of neck, nape and under side white, washed with yellowish, and whitish shafts at the bases of first five or six wing-feathers, making a white mark; two central tail-feathers slightly longer than the others, pointed. Breeds in the arctic regions, wintering south to coasts of South Africa.

A male taken at the seashore near Monrovia and an adult received by Büttikofer at the same place constitute the only records for this species. It is currently regarded as a winter bird on the west coast of Africa from Liberia to Cape Colony (Sclater) but the fact that as I (1927) have elsewhere recorded, we saw numbers of immature Jaegers at sea slightly north of these coasts in early July, and again in November, makes it appear probable that the non-breeding and immature birds spend the summer in the latitudes of Sierra Leone.

LARIDAE Terns and Gulls

Sterna hirundo Linné. Common Tern

Sterna hirundo Linné, Syst. Nat., ed. 10, vol. 1, p. 137, 1758: Sweden.

Length about 13 inches, wings long and narrow, tail deeply forked; top of head black, base of wings and back pearly gray, primaries with blackish band lengthwise on inner vane, tail and under parts white, feet red; bill red with black tip. Breeds in northern hemisphere.

The Common Tern is probably a common winter bird on the coast of Liberia, but Büttikofer (1885) states that he found large flocks throughout the summer months near the mouths of the rivers at Cape Mount; an adult male in full breeding dress was shot there on July 26, and other "probably younger" birds on April 26, July 26, and in mid-August. Nevertheless it may be presumed that these represent non-breeding adults and first-year birds. Thompson (1925) says that this is the commonest tern in Freetown Harbor, Sierra Leone, and I saw a number there in early November, but not on our passage south in July. He adds that they sometimes come inland for winged ants.

Sterna sandvicensis sandvicensis Latham. Sandwich Tern

Sterna sandvicensis Latham, Gen. Synopsis, Suppl., vol. 1, p. 296, 1787: Sandwich, Kent, England.

Slightly larger than preceding, but in general similarly marked, tail less forked, feet black, bill black, tipped with yellow. Breeds in Europe, winters in Africa coastwise, from Canaries to Cape of Good Hope.

This is the *Sterna cantiaca* of Büttikofer's lists. He found it uncommon apparently on the coasts, to which it is doubtless a regular winter visitor. On December 3 he shot one of two seen flying over the surf at Robertport; others were seen or taken by him and his associates at Marshall (near the mouth of the Junk River), at Grand Bassa and the River Cess, while an inland record was furnished by a specimen secured by Stampfli near Old Field on the upper Junk.

Sterna maxima albidorsalis Hartert. African Royal Tern

Sterna maxima albidorsalis Hartert, Vög. pal. Fauna, vol. 2, p. 1698, 1921: Cape Blanco, Africa.

Larger, length about 20 inches; crown and elongated feathers of occiput black, sides of neck and under side white, wings and back silver gray; tail and its coverts white; bill orange, feet black. In winter the crown is white, the elongated feathers black with white edges. West coast of Africa from Gibraltar to Angola.

No doubt this (with other species of terns and gulls) occurs on the Liberian coasts more commonly, but the only instance recorded is of a male taken February 10, 1911, at Subono by Lowe (Bannerman, 1912, p, 258).

Chlidonias nigra nigra (Linné). Black Tern

Sterna nigra Linné, Syst. Nat., ed. 10, vol. 1, p. 137, 1758: Sweden.

Small, length 9.5 inches; head and neck black; back, wings, and tail light gray; lower side slaty gray, anal region white; bill black, feet reddish. In winter, forehead, neck, and lower surface are white, only the occiput and nape are black. Breeding in southern and central Europe and western Asia; winters south in West Africa to Loango.

This is probably a wintering bird, but Büttikofer (1885, p. 250) on August 15 found a large flock, all apparently immature, near Robertsport, from which he secured twenty birds. In a later paper (1888) he mentions large flocks seen near Fish Town, Grand Bassa, on the sand flats before the mouth of the Bissaw River, but does not give the date.

Rhynchops flavirostris Vieillot. African Skimmer

Rhynchops flavirostris Vieillot, Nouv. Dict. d'Hist. Nat., vol. 3, p. 338, 1816: Senegal.

Size of a tern, about 16 inches long; lower mandible longer than upper and very compressed; top of head, neck, back, center of rump and wings, blackish brown; forehead, sides of head, under side, and lateral under tail-coverts white; primaries white-tipped; bill reddish, tipped with yellow, feet orange. Senegal and Egypt south to Orange River, coasts and rivers.

This bird may nest occasionally in suitable places on the Liberian coast; Büttikofer is the only authority for its occurrence, however. In the summer of 1881 he saw them, always in pairs, at various times on the coast near Robertport, and on August 17 a pair in full breeding plumage. Later, on September 26, he saw a pair with bills not fully developed.

COLUMBIFORMES

COLUMBIDAE Pigeons

Columba unicincta Cassin. Afep Pigeon

Columba unicincta Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 143: Ogowe River, W. Africa.

Length about 13 inches; head and neck light gray, center of throat white; back and wing-coverts slaty, pale edged, rump and upper tail-coverts slaty gray, breast pale vinaceous, sides light gray; center of abdomen and under tail-coverts white; tail slaty banded with white. Liberia to Ogowe.

This is the only species of typical *Columba* occurring naturally in Liberia, where, however, it seems to be exceedingly rare, and so far as known, is probably a bird of the high forest. We saw nothing of it, and the only records are the two of Büttikofer, the one a female taken at Soforé Place on the large, thickly-wooded island of Alin, and figured by him in colors (Büttikofer, 1885, p. 226); the other a single bird brought in by a native at Hill Town, January 4, but so badly injured that it was not preserved (Büttikofer, 1888, p. 97).

Turturoena iriditorques (Cassin). Gaboon Bronze-necked Pigeon

Columba iriditorques Cassin, Proc. Acad. Nat. Sci. Phila., 1856, p. 254: St. Paul's River, Gaboon.

Male: head blue-gray with green reflections, a coppery collar, iridescent; below vinaceous, under tail-coverts chestnut; tail with a buffy tip, the lateral feathers with chestnut inner webs. Female smaller with brown head and under side, the breast feathers minutely punctate. Feet pink, eye ring red. West Africa, Liberia to Angola.

With the general appearance of a small blue pigeon, this seems to be an uncommon species near the coast towns. At all events we did not find it about Monrovia, and Lowe regarded it as a rare bird on the southern coast, where he saw in all four at Nana Kru and Settra Kru. Büttikofer and Stampfli, however, obtained a few on the Junk and the Du rivers. In August we found it common on the Farmington River at Lenga Town in pairs or small groups. The crop of one was filled with small black seeds the size of No. 6 shot. Kemp (1905) regards it as scarce in eastern Sierra Leone, and our experience was that it became rare or absent toward the eastern part of Liberia.

Streptopelia semitorquata erythrophrys (Swainson). West African Red-eyed Dove

Turtur erythrophrys Swainson, Birds West Africa, vol. 2, p. 207, pl. 22, 1837: Senegal.

Forehead, rump, and under tail-coverts pale blue-gray; breast and neck vinaceous; above olive green. A black crescent on the hind neck; tip of tail white; a dusky band crosses the middle of the tail above. West Africa.

This is the common and characteristic dove, found in a variety of country, open tree growth or plantations, and is somewhat partial to the vicinity of clearings, where it feeds on the ground in small parties. In general, however, it avoids the heavy forest. Its usual note consists of two *coos* with the accent on the second, followed by a slightly crescendo series of four more, in precisely the same cadence as the nursery rhyme "One, two; buckle my shoe." After some six to ten repetitions it ends with two *coos* in a low tone. Büttikofer found its eggs in December, but the season of nesting doubtless commences earlier for I found a pair building on September 24, using the bushed-out top of a tall stump as a nest-site.

Tympanistria tympanistria fraseri Bonaparte. West African Tambourine Dove

Tympanistria fraseri Bonaparte, Conspec. Av., vol. 2, p. 67, 1855: Fernando Po.

Forehead, eye stripe, and under side of body clear white; above olive brown with metallic blue spots on wing; under tail-coverts dark brown, wings underneath, and axillaries rufous. Female differs in having a blue-gray wash across upper breast. Bill black; feet dull garnet. West Africa.

This beautiful little ground dove is much less plentiful than the following, and is a bird of thick cover, either second growth and nearly impenetrable scrub or high forest with undergrowth. The few that I saw were single birds. The crop of one secured at Paiata contained many small black berries. Büttikofer records it from the Junk River, Hill Town, and Robertport as occasional, and mentions having several times seen it sitting in high forest trees. No doubt to it should be attributed a deliberate ground-dove song often heard in the warmest parts of the day in deep forest when all else is silent, a long series of resonant *coos* on a descending scale, hurried a little toward the end.

Turtur afer kilimensis (Mearns). Blue-spotted Wood Dove

Chalcopelia afra kilimensis Mearns, Proc. U. S. Nat. Mus., vol. 48, p. 383, 1915: Mt. Kilimanjaro.

Top of head pale blue, throat whitish; cheeks, sides of throat, and the breast pale vinaceous passing into the dull olive of the upper surface. Two dark bands enclosing a buffy one across the rump; tips of upper tail-coverts also blackish, making a transverse band. Wing lining rufous; a large metallic blue spot on outer vane of six of the secondaries; basal under tail-coverts white, the longer ones nearly black. Sierra Leone and Kenya Colony, south.

This is the common and familiar little ground dove throughout Liberia in the open country, frequenting the clearings and edges of the rice-fields, or coming trustingly into the villages. It is usually found in pairs feeding together on the ground, or sometimes one may put up three birds or even several pairs from some field where the rice has lately been garnered and the scattered kernels remain to be gleaned. Other writers testify to its abundance, and Büttikofer regarded it as one of the commonest birds of the coast region. It avoids heavy forest and bushy growth. Its flight is low and weak, not long sustained, for it seldom goes more than fifty or a hundred yards before dropping to the ground again. According to Büttikofer its eggs have been found in December.

Calopelia puella puella (Schlegel). Gold Coast Odu Dove

Columba (*Peristera*) *puella* Schlegel, Bijdr. Dierk., pt. 1, p. 17, pl., 1848: Dabocrom, Gold Coast.

Head bright blue, upper parts chestnut; two metallic green spots on wing. Upper throat vinaceous, belly and upper tail-coverts bright rusty. Immature birds lack the metallic spots on wing. Sierra Leone to Cameroon Mountain.

This very handsome and brightly colored little dove is apparently everywhere uncommon. Büttikofer says that he only now and then met with it in low forest near Hill Town, once at Bavia, and once at Soforé Place, while Stampfli succeeded in procuring but four examples from the Junk and Du rivers. Our only specimen was taken in dense undergrowth on the bank of the Du, under a canopy of taller trees. It was walking quickly about on the ground a few yards from a boatful of people. It is no doubt essentially a solitary species. Kemp regards it as very rare in southern Sierra Leone.

Aplopelia simplex (Hartlaub). São Thomé Lemon Dove

Turtur simplex Hartlaub, Rev. et Mag. Zool., 1849, p. 497: S. Thomé Id., Gulf of Guinea.

Forehead pale blue gray; occiput and nape metallic green with coppery reflections, especially on sides of neck. Lower back, wings and tail dusky brown; chin white, upper breast and throat gray with green reflections; belly and under tail-coverts whitish; a terminal band on the tail gray above, white below.

The only specimen was brought in alive to us at Paiata by the natives who had doubtless trapped it in a snare. Careful comparison with a single skin from São Thomé reveals no important differences, though the back is perhaps slightly darker. Since the Cameroon Mountain bird as well as those of southern Cameroons and of Uganda have been given distinctive names, it may be that more and better material would show slight differences. There is apparently no previous record for the species either from Liberia or elsewhere among the neighboring countries.

TRERONIDAE Green Fruit Pigeons

Vinago calva sharpei Reichenow. Sierra Leone Green Pigeon; "Mangrove Pigeon"

Vinago calva sharpei Reichenow, Ornith. Monatsber., vol. 11, p. 45, 1902: Upper Guinea.

Above olive green except base of neck and the tail which are blue-gray; primaries black, narrowly and greater wing-coverts broadly edged with pale yellow; bend of wing vinaceous; below yellowish green; tibia yellow; longest under tail-coverts chestnut, the shorter ones whitish with olive-green central area. Iris and base of bill scarlet, feet yellow. Sierra Leone to Calabar.

While Sclater does not recognize the fruit pigeons as a family distinct from the Columbidae, the possession of an additional pair of tail feathers, short beak, and the peculiar coloration are striking features of the group. These beautiful pigeons are common and well distributed in the wooded parts of Liberia, especially on the edges of high forest or where there are patches of tree growth left between cultivated areas. They are silent birds, only occasionally giving a soft *coo* almost like a low growl. So well does their color blend with the green and yellow lights among which they live that one does not appreciate their extremely beautiful and variegated coloring until the specimen is examined apart from its natural surroundings. They have a way of sitting quietly, in pairs sometimes, or in small flocks after the breeding season, remaining nearly motionless among the branches for moments at a time. On September 7, at Gbanga, I watched one in a small tree by the river. It finally picked off a small dead twig and flew with it crosswise in its bill to a branch nearly over my head but presently dropped it and fell to eating some small berries growing close by, — a very quiet bird of deliberate motions. In early November we saw small flocks and Büttikofer mentions that they gather after the breeding season in large flocks, visiting the coastal regions from the interior, feeding on mangrove buds; or, again, at Hill Town, he records a flock that in January came every morning to feed on the small berry-like fruit of a species of fig tree. Lowe found them abundant on the south coast at Settra Kru in the same month.

CUCULIFORMES Cuckoos

CUCULIDAE

Cuculus canorus Linné. European Cuckoo

Cuculus canorus Linné, Syst. Nat., ed. 10, vol. 1, p. 110, 1758: Sweden.

Head, wings, and body blue-gray, wings with a brownish tint; breast and belly white with dark barring. Tail long, blackish, the feathers tipped and spotted with white. Size of a sparrow hawk, length 13.5 inches.

This is a breeding bird of Europe, wintering in Africa, but hitherto it seems never to have been taken in Liberia. It is therefore interesting to record an adult male shot November 6, 1926, by Mr. M. A. Cheek, just outside the town of Monrovia and given to us. It is probably rare so far to the westward and is not included in Kemp's list of Sierra Leone birds seen by him, though Thompson (1925) records that he several times saw it in the Karina district and shot one, January 9, at Mabanta in that country.

Clamator glandarius (Linné). Great Spotted Cuckoo

Cuculus glandarius Linné, Syst. Nat., ed. 10, vol. 1, p. 111, 1758: North Africa and Europe.

Length about 17 inches, tail long; top of head to eyes pale gray, bordered by dark brown; nape, back, tail and wings dark brown, the feathers of shoulders and wings tipped with white; throat buffy, rest of under parts white; tail-feathers tipped with white. Southern Europe to western Asia.

This is another winter visitor, breeding from Spain to Persia and wintering throughout Africa. There is but a single record, that of an immature female taken by Lowe, December 3, 1910, at Nifu on the Kru coast of Liberia (Bannerman, 1912, p. 243).

Clamator cafer (Lichtenstein). Levaillant's Cuckoo

Cuculus cafer A. Lichtenstein, Cat. Rer. Rar. Hamburg, p. 14, 1793: Kaffirland.

Length about 16.5 inches; head, neck, upper side of body, wings, and tail black with greenish reflections; tips of tail-feathers and ends of primaries white; fore neck whitish streaked with black; below white, more or less washed with yellowish, sides streaked; bill black, feet blue-gray. Africa south of the Sahara, wintering in South Africa.

This may be a commoner resident species than our experience led us to suppose, for Büttikofer (1885, p. 225) reported it as common, preferring brushwood and the edges of high forest near rivers. He collected specimens at Bavia on the St. Paul's River, and secured young birds in January and March. Chubb (1905) also records a specimen sent him from Boporo, on the same river, taken January 10, 1905. Possibly it is local in its distribution, for we saw nothing of it.

Chrysococcyx cupreus cupreus (Shaw). Yellow-bellied Emerald Cuckoo

Cuculus cupreus Shaw, Mus. Leverianum, p. 157, 1792: Gambia.

Small, about 9 inches. Male with the head, throat and upper parts bright metallic green, the feathers appearing scale-like; belly bright yellow. Tail proportionally long, the outer feathers shortest, with alternating white and green bars. The female has the back barred with brown and green. Africa from the Zambesi to Abyssinia and Sierra Leone.

Bannerman (1922) has shown that the names of the Golden and Emerald Cuckoos have been much confused. His record of a male of the present species taken by Lowe at Nana Kru, January 7, 1911, is the only one for Liberia.

Lampromorpha caprius (Boddaert) Didric Cuckoo; White-bellied Golden Cuckoo

Cuculus caprius Boddaert, Tabl. des Pl. Enlum., p. 4, 1783: Cape of Good Hope.

Length about 7 inches. Male: above dark green with yellow, bronze and blue reflections, wings dusky with white cross-bars. Outer tail-feathers with squarish white spots on both webs, those of the outer webs alternating with those of the inner. Below, white tinged with rusty, the sides of the abdomen with greenish-brown cross-bars. Iris and eye-ring scarlet. Africa generally.

This is the *Chrysococcyx cupreus* of most writers. From its coloring one would think this probably a bird of the forest, but the few we saw were in open areas about villages, perching on the topmost twig of even tall trees, whence they sallied out apparently for insects after the manner of flycatchers. At times, too, they would perch motionless on a low branch in an open situation. The first pair we saw at Yenghi, September 30, we took for small hawks, so similar were their manner of flight and habit of perching quietly on commanding points. The stomach of one of these contained remains of small insects and a caterpillar. At Moala, November 3, one was taken in an open field with small trees about. Büttikofer speaks of it being often met with in such situations and he found it also in the forests back of Monrovia; while on the Kru coast, Lowe found it a common bird in swampy places.

Lampromorpha klaasi (Stephens). Klaas's Golden Cuckoo

Cuculus klaasi Stephens, in Shaw's Gen. Zool., vol. 9, p. 128, 1815: Platte River, So. Africa.

Rather similar in general to the preceding but slightly smaller, and with the coppery green extending upon the sides of the upper throat and breast, and the outer tail-feathers nearly all white with a small green subterminal spot on the outer vane. The barring on the belly is finer and less obvious. The female may be told from that of the last species by the tail-feathers being nearly all white. Africa.

This is doubtless the less common of the two species of its genus in Liberia, but the general similarity of its coloration to that of the preceding may cause confusion in the field. The greater extent of green on the sides of the throat and the nearly white instead of barred outer tail-feathers will, however, readily identify it. Büttikofer in all his collecting secured but three specimens: an adult male at Hill Town, one from the lower Farmington River, and a third from Robertport (Büttikofer, 1888, p. 96; 1889, p. 125; 1890, p. 206). Lowe, however, in a brief time ashore at Nana Kru, on the south coast, secured a female and a male, respectively, on January 13 and 20, 1911. It is interesting that two rather closely allied species of this genus should occur together as here in Liberia, and one would expect that there might be some difference in their habits, perhaps in the species of birds each parasitizes, for like the European Cuckoo, these lay their eggs in the nests of other birds. Dr. Herbert Friedmann has suggested that as the nestlings of these two species and of *Chrysococcyx* are readily told apart, it would be valuable if persons having the opportunity to do so, would record what birds are found parasitized by each. He has therefore kindly supplied the following key: —

KEY TO NESTLINGS OF THE METALLIC CUCKOOS

A. Back coppery brown.......................... *Lampromorpha caprius* (Didric Cuckoo)

B. Back greenish.
  a. Forehead barred with brown; outer upper tail-coverts margined with white *Lampromorpha klaasi* (Klaas's Cuckoo).
  b. Forehead barred with white; outer upper tail-coverts not margined with white *Chrysococcyx cupreus* (Emerald Cuckoo).

Centropus leucogaster leucogaster (Leach). Black-throated Coucal or Spurred Cuckoo

Polophilus leucogaster Leach, Zool. Misc., vol. 1, p. 117, pl. 52, 1814: [Gold Coast].

Large, length about 22 inches; head, fore neck, and upper back shining blue-black, lower back and shoulders dark brown, rump blackish green with brownish cross-barring; tail steely black, shoulders reddish brown; below pale yellowish, center of breast and belly white. Senegambia to Gaboon.

Although we were on the lookout for this bird, we did not once identify it and it is evidently much rarer or more local in its distribution than *C. senegalensis.* Büttikofer is the only one to record it from Liberia. He mentions (1885, p. 223) a female from Bavia on the St. Paul's River, and other specimens from Schieffelinsville and Hill Town (1888, p. 96), while Stampfli secured three others on the Junk and Du rivers (1886, p. 264). In the vicinity of Cape Mount at Buluma, he found a nest, December 6, containing two young, placed in high grass about a foot above the ground "in brushwood," and later (1890, p. 205) secured two more at Robertport and Marfa River. Birds from this region have been distinguished as a distinct subspecies, *chalybeiceps*, with greenish heads.

Centropus senegalensis senegalensis (Linné). Senegal Spurred Cuckoo; "Doodoo"

Cuculus senegalensis Linné, Syst. Nat., ed. 12, vol. 1, p. 169, 1766: Senegal.

A large brown cuckoo, length 16 inches, crown and nape black, back and wings cinnamon, tail blackish with steely reflections; chin, throat, and abdomen white washed with buffy. Bill black. West Africa, Senegambia to Kuanza.

This is a common and characteristic bird, frequenting the dense thickets and scrub growth that spring up on the edges of clearings and about habitations, consistently avoiding heavy woods. No doubt the occupation and clearing of the land has favored its increase. It is one of the first birds to awaken in the dusk of the morning, when its peculiar liquid notes may be heard at short intervals, reminding one of the bubbling sounds produced by pouring water from a bottle, a dozen or so bubbling notes at first going down the scale, then rising toward the end. The bird has a characteristic way of perching on the tops of low bushes, and when in flight, as I once had a good opportunity to see distinctly, the feet are held directed partly backward. Büttikofer (1890, p. 205) mentions that the young are tinged with rufous below, and Oberholser (1899) has given a full description of the first plumage.

Ceuthmochares aereus flavirostris (Swainson). Senegal Green Coucal

Zanclostomus flavirostris Swainson, Birds West Africa, vol. 2, p. 183, pl. 19, 1837: West Africa.

Size of the European Cuckoo, head and belly smoky, throat and breast gray; back, wings, and tail iridescent blue to purplish. Bill yellow, iris red. Senegal to southern Nigeria.

This bird gives the impression of a long slender all-gray cuckoo, with a sharply contrasting yellow bill, yet Büttikofer (1890, p. 205) has recorded one with a black bill. We saw the bird several times and secured one of a pair at Gbanga, an adult female, September 6. Büttikofer found it near Robertport and Stampfli secured two on the Du River. It is apparently nowhere common, but occasional pairs are seen in bushy growth.

MUSOPHAGIDAE Plantain-eaters

Turacus persa buffoni (Vieillot). Senegal Touraco

Opoethus buffoni Vieillot, Nouv. Dict. d'Hist. Nat., vol. 24, p. 304, 1819: no locality.

Length about 17 inches; head, neck, breast, and upper back green, the crest sometimes tipped with reddish; a broad black band below the eye, bordered by white; wing coverts, shoulders, tail and rump violet red; lower back black with violet sheen; below slaty, washed with green; primaries and anterior secondaries vinaceous. Senegal to Sierra Leone.

This species was included among the birds of Liberia by Büttikofer on the authority of Hartlaub (Birds W. Africa, 1857) and is copied without comment by Chubb. While it may occur as a casual visitor, its presence has not been confirmed by later investigations, and it is likely that its inclusion is a mistake. According to Kemp it is found in Sierra Leone, so that its occurrence in northwestern Liberia may be looked for.

Turacus macrorhynchus macrorhynchus (Fraser). Black-tip Crested Plantain-eater; "Redwing"

Corythaix macrorhyncha Fraser, Proc. Zool. Soc. London, 1839, p. 34.

Size of a large cuckoo, 17 inches; head crested, green, the crest tipped with white then black; throat and breast green, belly blackish; back, wings, and tail steely blue, the primaries and secondaries mostly crimson; bill yellow with red base. Sierra Leone to Gold Coast.

This is a common and characteristic bird of the forest, keeping to large trees and often heard in early forenoon giving its deep sonorous calls. They have a way of running along on branches that is quite characteristic, and as the group passes from one tree to another, one by one will scale down from an upper branch, showing the beautiful crimson wing-patch which is not visible when the wing is folded. Büttikofer records that the immature lacks the black and white edging of the crest.

Corythaeola cristata cristata (Vieillot). Blue Plantain-eater; "Peacock"

Musophaga cristata Vieillot, Analyse, p. 68, 1816: Africa.

Size of a pheasant, length 29 inches; throat, wings, back, and tail above, peacock blue; a short black crest on head; breast greenish yellow, belly and thighs chestnut; tail below greenish yellow with broad black tip above and below; bill bright yellow with red tip. Senegal to Angola.

On account of its size and bright colors this is a conspicuous bird, universally known as "Peacock." It is characteristic of the high forest, and often may be seen in little troops numbering up to as many as ten, passing in leisurely manner from tree to tree, running along the outer branches to search for berries on which they feed. A female shot on the Du River, August 5, had the ovaries as large as peas.

PSITTACIFORMES

PSITTACIDAE Parrots

Psittacus erithacus timneh Fraser. Sierra Leone Gray Parrot

Psittacus timneh Fraser, Proc. Zool. Soc. London, 1844, p. 38: Timneh country, Sierra Leone.

Size of a pigeon, length 12 inches; general color dark gray, edges of the feathers paler; rump and abdomen paler gray or whitish tinged with blue-gray; tail crimson, under tail-coverts sometimes washed with crimson. A bare area around the eye; iris buffy white. Sierra Leone and Liberia.

This is the characteristic parrot of the Liberian forests. It seems to be at all times social, going about in pairs or more commonly in flocks numbering up to forty or more birds. The regularity of their passage to and from their feeding grounds in morning and evening is a matter of common observation. Although we were never able to discover their roosting places, Büttikofer mentions one on Alin Island, in St. Paul's River, where often many hundreds assembled for the night. We frequently observed their passage over our camp in the morning at just about daylight, sometimes indeed before the early mists had risen so that they flew past enveloped in the fog, but always with a continuous series of clear whistles interspersed with harsh, screeching notes, while just as regularly at sunset the flocks would return high overhead, heralding their approach by a similar chorus, as they came spread in a wide phalanx, their sharp swift wings and chunky bodies giving a highly characteristic appearance. They feed, among other things, on the bean-like seeds of a large mimosa-like tree, and on occasion probably on the seeds of the oil palm, in a plantation of which I once saw a small flock.

Agapornis swinderniana swinderniana (Kuhl). Black-collared Love-bird

Psittacus swindernianus Kuhl, Conspect. Psitt., p. 62, pl. 11, 1820: Africa.

Size of a crossbill, length 5.5 inches; head and upper back green, passing into olive yellow on the sides of the neck; a narrow black collar, washed with olive yellow below; rump dark blue, middle tail-feathers green with a red spot at the middle, the others red with a wide black band below the green tip; flight feathers mostly black edged with green; belly light green. Upper mandible black, lower bluish gray; feet gray, iris yellow. Liberia.

The typical race of this small parrot is found, chiefly at least, in Liberia, but seems to be local or uncommon for we saw nothing of it, although constantly looking for it. Büttikofer (1885) on his first sojourn in the country saw but a single small flock which came daily to feed on the fruit of a tall tree on the heavily-wooded island of Alin in the St. Paul's River. Here on successive days between May 31 and June 2, he secured eight specimens, practically wiping out the flock. On a later visit (1888, p. 94) he secured a few from a flock of twelve at Schieffelinsville, while Stampfli procured a series from the Junk River, where previously Schweitzer had collected a number. Nothing further seems to be known of it in the country. It is worth noting in this connection, however, that not far to the north in the vicinity of Freetown, Sierra Leone, Thompson (1925) records the related species, *Agapornis pullaria*, the

Red-headed Love-bird, as common, nesting in holes scooped out of the termites' nests in trees.

CORACIIFORMES

CORACIIDAE Rollers

Eurystomus afer afer (Latham). West African Broad-billed Roller; "Day Bat"

Coracias afra Latham, Index Orn., vol. 1, p. 172, 1790: Africa.

Size of a waxwing, length 9 inches; cinnamon above and below, washed with purple underneath and on the wing-coverts; under tail-coverts, under side of wings, and tail-feathers except their black tips, sea green; bill orange yellow. Female similar but abdomen green. Senegal to Congo.

This seems to be the commoner of the two species of this genus in Liberia, but curiously, we did not meet with it. Büttikofer and Stampfli found it near Fisherman Lake, Cape Mount, and on the Junk, Du, and Mesurado rivers all the way along the coast to Cape Palmas; while at Nifu and Nana Kru on the southern coast, Lowe regarded it as the commonest bird seen during his brief stay in January. Possibly it is more abundant on the coast or at certain seasons of the year, for it seemed to be lacking in the interior where we were. Thus Büttikofer at Hill Town saw hundreds nearly every evening wheeling in the air for insects but noted that in the daytime they would spend hours sitting on a dry twig exposed to the sun. At Mount Coffee, again, a short distance inland, Oberholser records that the single specimen sent him by Currie was the only one seen by that collector.

Eurystomus gularis gularis Vieillot. Blue-throated Roller

Eurystomus gularis Vieillot, Nouv. Dict. des Sci. Nat., vol. 29, p. 246, 1819: "Australasia."

Size of the preceding; rich dark cinnamon above and below, except the wings and tail which are black with blue central areas; longer upper and lower tail-coverts black; throat blue; bill broad, yellow. Senegal to Gold Coast.

The blue throat distinguishes this species at once. It is apparently much rarer than the preceding for in all his experience in the country Büttikofer met with it apparently but few times, and records only three specimens taken, namely, on the St. Paul's River at Bavia and Soforé Place. Oberholser (1899) records a single specimen taken at Mount Coffee by Currie, on the same river, and Chubb (1905, p. 207), a female from the St. Paul's River, December 16. The only bird we obtained was the male of a pair seen at Lenga Town on the Farmington River, August 21. They were perched after the manner of flycatchers on the dead twigs of a tall tree standing in a clearing, whence they would fly out to snap up passing insects and return to the twig. Their secondaries are so much shorter than the primaries that in flight the spread wing has a characteristic narrowed appearance at its base. At one or two other places we saw single individuals of this bird but it seemed altogether infrequent and Kemp (1905) regards it as rare in the interior of Sierra Leone. It would be interesting to establish what difference there may be between the habits and haunts of the two species. Possibly this is more stationary, and does not migrate over the rains.

ALCEDINIDAE Kingfishers

Ceryle rudis rudis (Linné). Black and White Kingfisher

Alcedo rudis Linné, Syst. Nat., ed. 10, vol. 1, p. 116, 1758: Egypt.

Length about 10 inches; above, black and white, the head finely streaked, the wings and back more barred with white; tail white with a broad subterminal black bar; eye stripe and lower side white, with a broad black band across breast. Mediterranean region and Africa.

This small kingfisher seems to be commonest along the coast, where it frequents the riverways and tidal creeks. We did not secure specimens and it is probably largely absent from the interior where most of our work lay. Büttikofer found it plentiful in the region of Cape Mount, especially near the mouth of the Marfa River, in the banks of which he found its nests, containing from three to six eggs. Other examples were taken on the Junk River and near the coast at Grand Bassa, but it was much less common. Slightly northward of the Liberian area, Thompson (1925) found it near Freetown, Sierra Leone, in the creeks, in mangrove swamps, and along the seaboard, but never saw it away from salt water, which further emphasizes its habitat preference.

Megaceryle maxima maxima (Pallas). Giant Kingfisher

Alcedo maxima Pallas, Spic. Zool., fasc. 5, p. 14, 1769: Cape of Good Hope.

Length about 18 inches; head, wings, and tail black, back and bases of wings mostly blue, the occiput, wings and tail-feathers with small scattered white specks; chin white with a few black marks, sides of neck black and white mixed with blue, and forming a broad band across chest broken below by white marks; belly and under tail-coverts deep chestnut; bill black. Africa south of the Sahara.

This big kingfisher is occasional along the larger streams even where they run through heavy forest. We saw it several times on the lower course of the Du when passing up or down by launch, and occasionally in the interior even along the smaller streams. Probably the presence of available banks for nesting sites in such places is a factor in its distribution. Büttikofer found it "not rare" around Fisherman Lake, Cape Mount, and the estuary of the Marfa River where mangroves prevail, but on the Junk, Farmington, and Du rivers, which are largely in forest, it was decidedly scarce. He found nests in holes on the bank of the Marfa, containing each but two eggs.

Alcedo quadribrachys quadribrachys Bonaparte. Shining-blue Kingfisher

Alcedo quadribrachys Bonaparte, Consp. Avium, vol. 1, p. 158, 1850: Guinea.

Small, length 7.5 inches; the back and top of head shining blue, tail and wings blackish; a white streak on each side of neck; throat buff; rest of under side fulvous. Feet red, the long slender bill black. Gambia to Togoland.

On his first journey to Liberia, Büttikofer failed to find this small kingfisher but in subsequent visits he and Stampfli secured specimens on the Junk, Mesurado, Du, and Farmington rivers, though he regarded it as very rare. We secured one on the Du and saw several others at various places along the lower course of the stream. They are apt to perch inconspicuously low among the half-submerged stems of bushes and fly low and silently just along the surface. It is a kingfisher that one does not see unless going along the water-courses by boat.

Corythornis cristata cristata (Pallas). Malachite Kingfisher

Alcedo cristata Pallas, in Vroeg, Cat. Adumbr., no. 55, p. 1, 1764: Cape of Good Hope.

Length about 5.5 inches; feathers of top of head bright blue banded with black, eye stripe, nape, body above and tail-coverts ultramarine; lores, sides of head and neck, belly and under tail-coverts rusty; throat and stripe on side of neck white; tail black washed with blue; bill and feet coral red. Africa south of Sahara.

This is the *C. cyanostigma* of Johnston's book on Liberia. Although Büttikofer found it tolerably common on the Du, sitting in low brushwood above the water, and he records other specimens from the Marfa and Junk rivers, we did not meet with it. No doubt it is confined to the waterways.

Ispidinia picta picta (Boddaert). Pygmy Kingfisher

Todus pictus Boddaert, Tabl. des Pl. Enlum., p. 49, 1783: Senegal.

Size of a wren; crown and back cobalt blue, tail black, sides of face tan color, except the ear-coverts which have purplish reflection; the lower surface of breast and body tinged with ochraceous; bill red. Senegal to Angola and Kenya.

This little kingfisher is probably uncommon, though Büttikofer secured specimens at various localities from Fisherman Lake near Cape Mount, to the St. Paul's and St. John's rivers. He found it not only along streams but also about clearings, feeding on insects. It may be readily told from the following species by its all-buff breast and belly.

Ispidinia leucogaster bowdleri (Neumann). Sierra Leone White-bellied Pygmy Kingfisher

Alcedo leucogaster bowdleri Neumann, Bull. Brit. Orn. Club, vol. 23, p. 14, 1908: Sierra Leone.

Similar to the preceding species, but the sides of head and body bright rufous, the throat and middle of breast and belly pure white; the rufous of the sides of the breast may occasionally form a nearly complete band across. Sierra Leone to Gold Coast.

Although Büttikofer in all his collecting in Liberia took only two of these little kingfishers (one on the Du and one on the Farmington River), it happened that the only ones of the genus that we obtained were of this species, both from Paiata on the St. Paul's River, in early October. So far as observed, it occurs along either large or small streams, following the waterways into clearings where they may be mere pools.

Halcyon senegalensis fuscopileus Reichenow. Garden Kingfisher; Forest Red-and-black-billed Kingfisher

Halcyon senegalensis fuscopileus Reichenow, Orn. Monatsb., 1906, p. 171: Jaunde.

Length 9 inches; crown gray, wings blue with a broad central black area; tail blue above, black below; chin whitish, breast and abdomen gray tinged with blue; upper mandible red, lower black; feet black. Sierra Leone to Angola.

H. cyanoleucus of both Büttikofer and Chubb is presumably identical with this form. It is the most common and conspicuous of the Liberian kingfishers, seeming to prefer the vicinity of settlements and the open places that they afford rather than the close proximity of streams. It was the first native land bird we saw on the West African coast, when on going ashore at Freetown, Sierra Leone, a pair was seen, one in hot pursuit of the other, giving loud rattling calls and finally alighting familiarly on the housetops. Thereafter we found them familiar village birds, frequenting the clearings, perching in dead trees about the villages, or boldly alighting on the peaks of houses or the projecting poles of the native huts. They seem to be chiefly insectivorous and in the stomachs of the specimens taken were nothing but insect remains, including in one case some green locustids. Its confiding habits and characteristic manner of perching have won for it in Sierra Leone the appropriate names of Garden Kingfisher and Telegraph-bird. We usually saw them in pairs which may have been mated birds; or small family parties might be found, keeping more or less together on the outskirts of a village. They avoid the heavy forest.

Halcyon malimbicus forbesi Sharpe. Nigerian Blue-breasted Kingfisher

Halcyon forbesi Sharpe, Cat. Birds Brit. Mus., vol. 17, p. 247, pl. 6, fig. 2, 1892: Shonga on the Niger.

About the size of a Belted Kingfisher; breast, sides of neck, shoulders, middle portion of wings and tail bright blue; remainder of wings and under side of tail black, throat and belly white; upper mandible chiefly red, lower black or with reddish edges; feet dull red. Gambia to Cameroon Mt., and inland to northern Nigeria.

Superficially this at first might be mistaken for the preceding species but in addition to its larger size may be immediately recognized by the blue band across the breast and by the reddish instead of black feet. In habits it is more of a frequenter of the edges of streams and probably feeds to some extent on fish. Although Büttikofer regarded it as tolerably common along the Du and the Junk rivers, and secured a series from St. Paul's River and Fisherman Lake, we saw relatively few, perhaps because we were unable to collect along streams to any extent on account of the high waters. The only adult we saw was one secured at Gbanga, but in mid-October, two nestlings were brought us at Paiata. Büttikofer notes that the stomach of a forest-killed bird contained grasshoppers and mantids, while those killed in the mangrove swamps contained small crabs.

Halcyon leucocephala leucocephala (P. L. S. Müller). Gray-headed Kingfisher

Alcedo leucocephala P. L. S. Müller, Syst. Nat., Suppl., p. 94, 1776: Senegal.

Length about 8 inches; head and neck brownish gray to pale gray; a white eye-stripe and a small black mark before eye; back and shoulders black, rump and tail bright blue, latter with black inner edges; primaries black, secondaries blue edged with black; throat and breast white, belly and under tail-coverts chestnut red; bill coral red, feet dull red. Senegal to Cameroons and East Africa.

This is apparently a rare or retiring species in Liberia, and a bird of dense thickets in the forest. Büttikofer in all his collecting secured but few specimens, these apparently in "brushwood" along the Du and Junk rivers, or on the edges of clearings. We saw the bird but once, perched in a jungle of vines beneath larger trees through which the forest path ran. Although the specimen was doubtless killed, we were unable to retrieve it after several attempts for it fell in thick cover where a large column of driver ants swarmed over the ground and vegetation. It must be an insectivorous species altogether.

Halcyon badius badius J. and E. Verreaux. Chocolate-backed Kingfisher

Halcyon (*Cancrophaga*) *badia* J. and E. Verreaux, Mag. de Zool., 1851, p. 264: Gaboon.

Size of a thrush; top and sides of head and upper back dull reddish chocolate; rump bright blue; wings black with a bright blue bar; tail blue edged with black above; below white, breast feathers faintly edged with dusky; bill all red. Liberia to Belgian Congo.

This handsome kingfisher is apparently everywhere uncommon, and though like the preceding species, a bird of the heavy forest, it may occupy a slightly different niche, if we may judge from the fact that the only bird we saw was perched on the lookout for insects in the lower story of forest trees, where the branches were somewhat open, at a height of perhaps thirty or forty feet. Our specimen contained in its stomach a large dragonfly, an insect also of rather open spaces, while Büttikofer records in the stomachs of his specimens beetles and other insects. He secured two on the Du, as well as two others at Soforé Place, St. Paul's River, "in brushwood" (that is, second growth), surrounded by high forest.

MEROPIDAE Bee-eaters

Merops persicus persicus Pallas. Blue-cheeked Bee-eater

Merops persicus Pallas, Reise, vol. 2, p. 708, 1773: Caspian Sea.

Length about 6 inches; above green, washed, especially on rump with blue; forehead and broad eyebrow stripe light blue; a black band on side of face, below it a narrow white, and a broader blue one; upper throat yellow, lower throat reddish brown; belly green. Southwest Asia wintering in Africa.

Under the name *M. superciliosus*, Büttikofer (1889, p. 117) records having taken a single bird at Mt. Olive and another at Schieffelinsville, which Reichenow refers to the Persian Bee-eater.

Aerops albicollis albicollis (Vieillot). White-throated Bee-eater; "Dry-time Bird"

Merops albicollis Vieillot, Nouv. Dict. des Sci. Nat., vol. 14, p. 15, 1817: Senegal.

A small species, length 11 inches; crown, eye-stripe, and throat-band black, the last edged with blue; back green; tail blue above, the central pair of feathers elongated; lower breast greenish, belly buff. Wing with outer primaries blue on outer edge, then bronze; secondaries buffy with black ends; tertiaries blue. Iris red. Senegal to Gaboon and Belgian Congo.

As in Sierra Leone (Kemp, 1905), this is a common bird in the drier parts of the year, but definitely migrates, probably in April, and is practically absent until the rains abate somewhat, returning again in November. No doubt it was for this reason that we did not see it from the time of our arrival in early July, until November 2, when a small flock appeared at Moala, and a few days later Whitman found them at Monrovia. The small flocks we saw would perch here and there on the tops of small trees or on dead branches, sallying forth after insects in longer or shorter flights on spread wings.

Büttikofer, who did most of his collecting in the drier part of the year, says they are very common everywhere in open country; large swarms in the air shortly before sunset may be very noisy. He gives no dates, but Chubb records two taken at Boporo on March 5, while Currie (Oberholser, 1889, p. 27) took specimens at Mount Coffee as late as March 13. After this time until November it is doubtless largely absent, and is one of the few species of breeding birds that thus absents itself during the rainy season.

Melittophagus pusillus pusillus (P. L. S. Müller). Little Bee-eater

Merops pusillus Müller, Nat. Syst., Suppl., p. 95, 1776: Senegal.

Small, length about 7 inches; above green, eye-ring light bluish green; a black eyebrow band; throat yellow; a black shield on breast edged with reddish brown; belly and under tail-coverts rusty, washed with yellowish green; wing feathers rusty with narrow green outer edges; middle tail-feathers green, the others rusty, with greenish outer edges and a broad subterminal black band. Senegambia to Cameroons.

We did not meet with this species. Indeed, the only records for Liberia are those of Büttikofer, who remarks that it is much less common than the preceding species, living in pairs or small groups (probably family parties), in open country or about the clearings. It keeps near the ground picking up ants and other running rather than flying insects. He mentions that Stampfli took one from its nest-hole, which was excavated in the ground of a sandy grass field, far off from any water. Others were taken at Schieffelinsville and on the Mesurado River at Paynesville. It is possibly migratory like the preceding.

Mellitophagus gularis gularis (Shaw and Nodder). Black Bee-eater

Merops gularis Shaw and Nodder, Nat. Miscellany, vol. 9, pl. 337, 1798: Sierra Leone.

Small, length about 8 inches; forehead, rump, streaks on lower breast, the abdomen and under tail-coverts bright blue; throat scarlet; a tawny area on middle of wing; elsewhere black. Sierra Leone to Cameroons.

In southeastern Sierra Leone, Kemp (1905) found this to be also a migratory species, leaving in May and returning in mid-August, therefore making a shorter absence than the White-throated Bee-eater. No doubt the same is largely true of it in Liberia, for we did not see it until October 24, at Banga, where a small party, apparently consisting of an adult pair and three or four full-grown young, were seen along the small growth by an open road, close to a stream. The adult female and three of the immature birds were taken, the latter all males with very small testes. Büttikofer regarded it as uncommon, but secured a number of specimens along streams or in open places, such as the graveyard at Monrovia. It may occur in flocks of even six to ten birds. It does not make the spectacular evolutions of *Ae. albicollis*, but rather, short direct flights, even plunging into the water for insects.

BUCEROTIDAE Hornbills

Bycanistes fistulator (Cassin). Piping Hornbill

Buceros fistulator Cassin, Proc. Acad. Nat. Sci., Philadelphia, vol. 5, p. 68, 1852: West Africa.

Size of a large cuckoo, about 19 inches, with large bill and long tail. Bill short, compressed, and furrowed at base of lower mandible. Belly and thighs, inside of wings, tips of secondaries, and all but central tail-feathers, as well as upper and lower tail-coverts white; elsewhere black with steely reflections. Senegal to Niger.

Of the small black and white hornbills, this may be recognized by its white outer tail-feathers. It is apparently less common than *L. semifasciatus*, indeed the only specimen we secured was one shot by Dr. Shattuck on the Du, an adult female, August 8. Büttikofer (1885) found it only during the rainy months, from July to September, and secured a large series at Soforé Place, where small flocks visited some fruit-bearing trees in the forest with clock-like regularity. Possibly this periodic appearance may be regulated in part by the ripening of favorite fruits, and at other times the birds are more scattered. At all events Lowe (Bannerman, 1912) found it on the southern coast of Liberia at Subono, which he visited on February 10 and on March 4.

Bycanistes cylindricus (Temminck). Black-thighed Hornbill

Buceros cylindricus Temminck, Pl. Col., livr. 88, pl. 521, fig. 2, 1831: Cape Coast, West Africa.

Length about 30 inches, of which the tail is a little less than half; black, the rump, upper and lower tail-coverts, belly, and wing-tips except two outer primaries, white; tail-feathers white at base and tip, black centrally; naked skin about eye reddish, bill white, brownish in middle, with well-developed upper horn. Liberia to Gold Coast.

Büttikofer regarded this as the rarest of all the hornbills in Liberia. He secured but two, both females, near Soforé Place. They hide in the thickest crowns of the forest trees. A single skull he also mentions from the Du. There are no other records.

Lophoceros semifasciatus (Hartlaub). Allied Hornbill; "Palm-bird"

Buceros semifasciatus Hartlaub, Journ. f. Orn., vol. 3, p. 356, 1855: Rio Boutry, Gold Coast.

Of medium size, black above with greenish reflections, belly and a spot near the base of the outer primaries white; second and third tail-feathers on each side with long white tips. Bill without projection on upper margin, its tip and a line along the edge of the culmen, and a parallel one along the gape black; elsewhere yellowish, the groove in front of nostril black bordered with chestnut. Senegambia to Gold Coast and northern Nigeria.

This is undoubtedly the commonest species of hornbill in Liberia, easily distinguished by the plain coloring, and the long white tips to the second and third outer feathers of the tail. It is a bird of the tree tops and high forest but often comes into the more open tree growth, sometimes in large flocks, at least in the summer months (July or August), trooping along in a straggling way from tree to tree. They also visit the groves of oil palms and feed to some extent on the pulpy fruit, whence the local name, "Palm-bird." In mid-September at Gbanga I saw a bird fly to a hole high up in the trunk of a tree and clinging to the opening, emit a shrill squeaking note. Possibly this was the nest hole.

Lophoceros hartlaubi hartlaubi (Gould). Dwarf Hornbill

Toccus hartlaubi Gould, Proc. Zool. Soc. London for 1860, p. 380, 1861: West Africa.

Small, length about 16 inches; head, throat, and upper side of body grayish black; a grayish white eye-stripe; below, white mixed with gray; wings black with broad white inner edges; tail steely black, the three outer feathers with white tips; naked skin about eye black, passing to yellow and violet red at sides of throat; bill with short compressed horn, black with red tip. Liberia to Cameroon.

The slaty-black bill with a dark red tip should distinguish this bird in the field. It is apparently rare, for Büttikofer secured but a single pair and speaks of it as confined to the forest, going about singly or in pairs, and a very silent bird. Currie, who secured it at Mount Coffee, notes that it is locally called Monkey-bird. Oberholser regards this as a separate genus for which he has proposed the name Horizocercus.

Lophoceros camurus pulchrirostris (Schlegel).

Buceros pulchrirostris Schlegel, Ned. Tijd. Dierk., vol. 1, p. 74, pl. 4, 1863: St. George d'Elmina, Gold Coast.

Length about 13 inches; head, neck, and body above reddish brown, throat-feathers white-edged; belly and under tail-coverts white; wings black, the coverts and edges with white markings; tail blackish, the outer feathers white-tipped; bill red, in the female black. Liberia to Loango.

Like the preceding, this is a species of the high forest, and apparently uncommon, for we did not secure it. Büttikofer mentions obtaining six at Soforé Place, as well as others from Hill Town and the Junk River while Chubb records it from St. Paul's River. The bright scarlet bill should be a good field-mark.

Tropicranus albocristatus albocristatus (Cassin). White-crested Hornbill; "Monkey-bird"

Buceros albocristatus Cassin, Proc. Acad. Nat. Sci., Philadelphia, vol. 3, p. 330, 1848: St. Paul's River, Liberia.

A large species with very long graduated tail; head white, the longer feathers with black shaft-stripes, and forming a crest; elsewhere blackish with green reflections. Each feather of the tail with a short white tip; bare throat patches pink. Females slightly smaller with smaller bills. Liberia and Sierra Leone.

The White-crested Hornbill is a bird of the forest, seldom seen in the open, but keeping in the shelter of the trees or sometimes coming into thick cover of small trees and even alighting on the ground to feed. Apparently it is not social and is seen singly or in pairs, silently travelling by short flights through the thick forest. We saw it occasionally for though it is fairly common it is not at all conspicuous. Büttikofer records nestlings half-fledged in the end of January from St. Paul's River and Cape Mount, and Oberholser has recorded (under *Ortholophus leucolophus*) an immature bird, taken April 30, with the white throat of the first plumage. It is locally called "Monkey-bird," on account of the belief that it follows monkeys and warns them of danger. The truth probably is that it is partial to the thick high trees and feeds to some extent on the same fruits as the monkeys.

Ceratogymna elata (Temminck). Yellow-casque Hornbill; "Palm-bird"

Buceros elatus Temminck, Pl. Col., livr. 88, pl. 521, fig. 1, 1831: Sierra Leone.

A very large bird, length 35 inches; the male black with steely reflections, the outer tail-feathers white; skin of throat from below eye to basal third of large dew-lappet black, tip of latter, chin, and ring around eye blue; iris red. Female with a smaller casque, the head dull reddish. Portuguese Guinea to northern Cameroons.

This fine great bird is common in the Liberian forests and by reason of its size and loud notes at once attracts attention. At our first camp on the Du it was daily seen, usually a pair or single birds flighting across the clearing from one part of the forest to another. Three birds, probably a pair and a full-grown young, came daily at various times to a great silk-cotton tree by the river's edge, and there was some evidence that it contained a nesting cavity in a large hollow limb. The manner of flight is most characteristic, consisting of several powerful downward strokes of the wings with a considerable amplitude below the level of the body, followed by a long sail with set wings, on a slight downward course, when presently the powerful wing-strokes are repeated, followed by another long, slow sail, and so on until the bird has reached its destination. Frequently the number of wing strokes would be but four between the long sails, but sometimes, more, and occasionally I counted as many as eighteen or twenty beats. Such is the force of the wing-beat that the swish of the air rushing between the expanded tips of the primaries may be heard for a considerable distance, and often as one stands among the great trees in the silence of the forest, it is all that apprises one of the passage of the bird. The neck is carried stretched out in front in flight, and as the wings flap, the tail opens and shuts in a most grotesque manner, giving the impression that the bird is coming apart with the exertion of flight. Very often I noticed that the male bird of a pair, easily distinguishable by the larger casque with a projecting horn, slightly preceded the female when the pair were flying together. The note, far from resembling the braying of a donkey as Johnston puts it, is a hoarse raven-like croak, or when perched in a tree, a low cawing much like that of a young crow. On August 16, Coolidge and I saw a nearly grown young bird with the male parent, perched on one of the upper branches of a great tree by the Du. The young bird's head was still downy and it flapped its wings in a begging attitude, at the same time giving a faint cawing note. The stomach of the large male shot, held two large fruits each with a stone, about the size of peaches, having a coarse yellow pulp. Büttikofer notes that it feeds on the fruits of several large kinds of forest trees and when the oil-palm nuts are ripe, in February and March, it is fond of them too, whence it has acquired the local name of "Palm-bird." He further records, which we did not see, that the small family parties may at times gather into large flocks, and describes a roosting-place where the birds came in to spend the night among small trees, perching from ten to twenty feet above the ground. They were quick to abandon it, however, on being disturbed, and in general are rather wary birds. A tame young bird that Büttikofer kept, had to be fed on fruit for about two months before it was able to take food for itself. It slept with its tail turned up and clapped to its back, in an attitude, which, as Dr. Herbert Friedmann has informed me, is characteristic of young hornbills of other species, and no doubt is to be correlated with their hole-nesting habits, for otherwise there would be no room for the long tail in the cramped nesting cavity.

Ceratogymna atrata (Temminck). Black-wattled Hornbill

Bucorvus atratus Temminck, Pl. Col., livr. 94, pl. 558, 1834: Ashanti country.

Nearly as large as the preceding; black with steely reflections, the tail with all but the central pair of feathers white-tipped; naked skin about the eye and the dewlappet, bright blue, its upper part with small, scattered black feathers. Female with the head and neck reddish brown, cheeks whitish. Liberia to Angola and Semliki.

This is much the rarer of the two large hornbills, and although we were constantly on the lookout for it, did not see it in all our stay. Büttikofer records specimens from the St. Paul's River, Hill Town, and Mt. Olive. Chubb (1905) also mentions one from eastern Liberia, and describes it as all black except the outer tail-feathers which are broadly tipped with white. Although it is said to be of similar habits with the preceding species, it is likely that there are significant differences resulting in its greater scarcity.

STRIGIFORMES

STRIGIDAE Wood Owls

Strix woodfordii nuchalis (Sharpe). West African Wood Owl

Syrnium nuchale Sharpe, Ibis, ser. 2, vol. 6, p. 487, 1870: Fantee.

Length 14 inches, head without ear-tufts; above chestnut brown mottled with small three-cornered white spots, edged with black; below banded with reddish brown and white in irregular lines; facial disk mottled reddish brown and white. West Africa to the Lake region.

This is probably not an uncommon owl in Liberia. The only owl secured by Büttikofer on his first visit to the country was an immature male of this species near Monrovia, and it was probably the same species of which we saw a single bird in that city leaving a thick tree at dusk. Büttikofer's co-worker, Stampfli, later collected three on the Junk and the former on later trips obtained others, one a young in down at Robertport, as well as an adult shot from a mangrove stump by the river. Its stomach contained beetle remains. Kemp (1905) regards it as a common owl in Sierra Leone. Probably, this is the species meant by *Scops senegalensis* in Hartlaub's Birds of West Africa, and copied without comment by Büttikofer and Chubb.

Otus letti (Büttikofer). Lett's Owl

Bubo letti Büttikofer, Notes Leyden Mus., vol. 11, pp. 34, 115, pl. 6, 1889: Liberia.

Medium size; general color rufous, the long ear-tufts white with dark cross-bands in their upper part; lower part of facial disks white, bordered below with blackish. Tail rufous with seven broad black bars; wings with a large white oval spot on four of the median coverts, the quills barred. Liberia to Cameroons and French Congo.

No other specimens have been taken in Liberia since Büttikofer collected the original one, a female, in the Kpwesi country.

Bubo africanus cinerascens Guérin. Spotted Eagle-owl

Bubo cinerascens Guérin, Rev. Zool., 1843, p. 321: Abyssinia.

A large species with prominent ear-tufts, length about 17 inches; above mottled dark brown and yellowish brown with roundish white spots on occiput, neck, shoulders, and wing-coverts; facial disk dark brown and white mottled; below white on chin, the body with dark cross-banding. Sierra Leone to Abyssinia.

The only record is of an adult female secured by Büttikofer at Grand Cape Mount, where it was kept in captivity by a native and later died. The eyes were said to be brown in life, not yellow as in *leucostictus*.

Bubo leucostictus (Hartlaub). Akun Eagle-owl

Bubo leucostictus Hartlaub, Journ. f. Ornith., vol. 3, p. 354, 1855: Dabocrom, Gold Coast.

A medium-sized owl with ear-tufts; above, a mottled dark brown and tawny, lighter below; outer border of scapulars white, forming a conspicuous white shoulder-stripe. West Africa, east to Belgian Congo.

Büttikofer secured an adult female at Schieffelinsville as well as a male at Hill Town; and at the latter locality a nestling in down, February 2. Otherwise there appear to be no records, yet it was the only owl that we collected. Our first was the female of a pair, taken September 9, at Gbanga. The birds were in a patch of dense forest, high up among the branches, where the quick eye of my native guide spied them. The specimen showed the yellow iris as mentioned by Büttikofer, and its stomach was filled with the remains of large beetles. The skin of the belly was so thickened that the bird was very likely incubating at the time. The second specimen was shot by Dr. Linder who noticed the bird in the noon hours sitting at rest high up in the branches of a big silk-cotton tree near the village of Medina, October 30. It was possibly this same owl whose soft hollow *hoo* we occasionally heard at night.

This owl is placed by some in the genus *Huhua*, which has much smaller feet than the typical Eagle-owls of the genus *Bubo*.

Scotopelia peli peli Bonaparte. Pel's Fishing Owl

Scotopelia peli Bonaparte, Consp. Avium, vol. 1, p. 44, 1850: Ashanti.

Length about 22 inches, tarsus unfeathered, no ear-tufts; above, wings and tail rusty bordered with black, head and neck feathers with black tips; face and lower side ochraceous, breast and belly streaked with dark brown. Feet pale grayish yellow, bill blackish. Senegal to Angola.

The only claim of this owl to a place in the Liberian list rests on Büttikofer's statement that he secured the head of a nestling, whose powerful black bill seemed to indicate its identity as of this species.

Scotopelia bouvieri Sharpe. Bouvier's Fishing Owl

Scotopelia bouvieri Sharpe, Ibis, ser. 3, vol. 5, p. 260, 1875: Lopé, Ogowe River, Gaboon.

Smaller, length about 17.5 inches; above finely mottled dark brown and rusty, forehead whitish; sides paler, rusty streaked. West Africa.

Büttikofer recorded a specimen taken by Stampfli on the Junk River as distinguishable from *S. ussheri* of the Gold Coast by the vermiculated upper surface, so that it may possibly represent the species *bouvieri*. The likelihood is, however, that it is the same as the next, and Sclater in giving the distribution of the species as Cameroon to Gaboon adds "perhaps Liberia (Büttikofer)."

Scotopelia ussheri Sharpe. Rufous-backed Fishing Owl

Scotopelia ussheri Sharpe, Ibis, ser. 3, vol. 1, p. 101, pl. 12, 1871: Fanti, Gold Coast.

Length about 20 inches; above uniform rusty brown, paler below; wings and tail pale yellowish brown with black cross-bands; bill yellowish. West Africa.

A female from Mt. Gallilee, taken by Stampfli, is supposed to have been this species (Büttikofer, 1889, p. 116).

CAPRIMULGIFORMES

CAPRIMULGIDAE Goatsuckers

Caprimulgus natalensis accrae Shelley. Gold-Coast White-tailed Nightjar

Caprimulgus accrae Shelley, Ibis, ser. 3, vol. 5, p. 379, 1875; Accra, Gold Coast.

A small nightjar, mottled grayish brown, buffy, and black, the crown with broadly striped feathers; a series of more or less quadrate or triangular black spots on scapulars; throat white; a large white spot on the three outer primaries at about two-thirds their length; entire outer web and terminal half or more of inner web of the two outer tail-feathers white. Liberia and Gold Coast.

Throughout much of Liberia it is probable that nightjars of all kinds are rare or largely absent, at least in the wetter times of the year. It is hard to see how a ground-resting bird could find a dry spot for its all-day repose in the rainy season, or how a ground-nesting species could survive attacks from the myriads of ants that swarm over the forest floor or on open areas. Probably for these reasons, this species where found is local, and prefers more or less barren places. Büttikofer evidently found it scarce, and notes two specimens from Buluma, near Fisherman Lake, Cape Mount, where in the evening on barren ground it could be easily approached; another from Mt. Olive with white markings on the ends of the two outer pairs of tail-feathers, is later (1889, p. 156) recorded under *Caprimulgus cinnamoneus* or *inornatus* while *C. fossii* is included in the Liberian list on the basis of the old identification of Hartlaub, and later copied by Chubb. Doubtless all these names refer to the one form here treated. Although I spent many evenings in different places on our journey especially on the lookout for nighthawks or other crepuscular species, I quite failed to see a single bird. It was not until our return to the coast in November that specimens of this species were secured, one November 7, the other on the 17th, on the roads outside Monrovia. Dr. Shattuck and Mr. Whitman who secured these specimens, several times saw nightjars fly up from the road in the light of the automobile lamp, and the first was startled from a similar station in early morning. Lowe (Bannerman, 1912) secured two at Nana Kru on the south coast, on January 4 and 12, 1911, respectively, where he found them ' among grassy slopes sitting on dark stony ground." No doubt the comparative barrenness of the roads and the stony slopes offers the birds undisturbed conditions for rest which would not be the case in the forests or in the cultivated areas.

Scotornis climacurus (Vieillot). Long-tailed Nightjar; "Night-bird"

Caprimulgus climacurus Vieillot, Galérie Ois., vol. 1, p. 195, pl. 122, 1825: Senegal.

Length about 14.5 inches of which the tail is about 11; finely mottled above with black on a rusty-brown ground, sometimes with an obvious rusty collar; white tips of outer wing-coverts forming a wing-bar, the other wing-coverts more or less white-tipped; below, pale brown mottled or banded with dark brown; outer tail-feather with white tip and outer edge, the second with white tip; a white mark on outer primaries. Senegal to Gaboon and east to the Nile Valley.

Probably there is a local or seasonal peculiarity in the distribution of this bird, for in all our field work by day we never started a single one nor in the many evenings spent watching for dusk-flying species did we ever see one, yet in the Sudan, with similar collecting work I became very familiar with the species. Nevertheless, it is probably common in Liberia at certain seasons, and doubtless more so near the coast. Büttikofer found it about Fisherman Lake and along the seashore at Grand Cape Mount, and speaks of it as a very frequent bird in brushwood as well as in coffee plantations at Schieffelinsville, while Stampfli secured two at Gallilee Falls on the lower Farmington River. No dates are given but it may well be that it occurs chiefly in the drier parts of the year which would account for our failure to find it. Perhaps, too, it is less common inland. On the southern coast of Liberia, Lowe (Bannerman, 1912) regarded it as the more common of the two nightjars in early January, and found it at Nana Kru in the cassava plantations and along the edges of wooded swamps. In Sierra Leone, Thompson (1925) found it a bird of the coastal districts and states that in the interior the Pennant-winged Nightjar, *Macrodipteryx longipennis* seems to take its place. The latter no doubt will be found to occur sparingly at certain seasons in parts of Liberia, for it has been taken in Sierra Leone only a short distance from the Liberian border, but in open savannah country.

MICROPODIFORMES

MICROPODIDAE Swifts

Apus apus apus Linné. Common Swift

Hirundo apus Linné, Syst. Nat., ed. 10, vol. 1, p. 192, 1758: Europe.

Length about 7 inches, blackish brown with slight greenish reflections, a black spot before the eye; chin white; immature birds with a larger white chin spot and a white band on the forehead. Breeds in Europe and North Africa, winters to South and West Africa.

The only record of this species is that of Büttikofer (1890) who records an adult female shot at Robertport, November 7, in plumage not different from the European bird. This was probably a migrant newly arrived from the north. The paucity of records for swifts is no doubt due to the difficulty of shooting them or of distinguishing the different species on the wing.

Micropus affinis abessynicus (Streubel). Little African Swift

Cypselus abessynicus Streubel, Oken's Isis, 1848, col. 354: Abyssinia.

Form swallow-like; head, wings, tail, and under tail-coverts grayish brown, the body blackish with steely reflections; chin, throat and rump-patch white. India and Africa.

This is a common species about Monrovia and no doubt elsewhere near the larger towns on the coast, but it is evident that the birds prefer the town with its well-made houses under the overhanging eaves of which their nests are freely plastered. We saw many here, but in July the birds seemed all to be strong on the wing and were apparently not nesting. Toward evening they gradually gathered into companies consisting of both this and the following species, until hundreds were careering about in dense swarms with a thin chippering note, finally settling for the night. Exactly where they went we did not learn, except that some at least entered small holes near the peaks of roofs. From the time that we left Monrovia in July for the interior until our return in early November we saw no more of this species, and they are evidently rather closely limited to the urban situations. On November 19 and 20 Mr. Whitman secured a pair of adult birds and two well-grown nestlings at Monrovia. The latter still retained a few soft drab feathers of the juvenal plumage, but the blackish feathers of the first-winter dress were coming in on the back. It is noteworthy that Büttikofer does not mention this bird, hence it may be that its occurrence in numbers at Monrovia is a development of more recent times.

Tachynautes parvus brachypterus (Reichenow). Palm Swift

Tachornis parvus brachypterus Reichenow, Vög. Afr., vol. 2, p. 386, 1903: Loango, French Congo.

Small, length about 6 inches, outer tail-feathers longest; above grayish brown, below somewhat paler, throat and lores whitish. Sierra Leone to Angola.

Like the preceding this swift seems to prefer the vicinity of the coastal towns, at all events it was abundant at Monrovia, coursing swiftly about in small companies during the day and gathering at sunset into large swarms that wheeled back and forth in a more or less concerted manner preparatory to going to roost. Apparently it is only locally abundant, for Büttikofer does not mention it, and on the southern coast, Lowe (Bannerman, 1912) regarded it as rare, for he secured but a single specimen at Nana Kru, January 6, 1911, and saw only half a dozen in all. After departing from Monrovia for the interior, we practically left this species behind, for in the course of our journey to the eastern border we saw very few indeed, these usually in small groups flying past high overhead. Evidently the native villages have no attraction for them back from the coastal palm districts.

TROGONIFORMES

TROGONIDAE Trogons

Apaloderma narina narina (Stephens). Narina Trogon

Trogon narina Stephens, in Shaw's General Zool., vol. 9, p. 14, 1815: Knysna.

Length about 11 inches; above a beautiful bronzy green, the tail steel blue with narrow green edging; naked area on side of head grayish blue to yellow crossed by a band of green feathers, lower side and under tail-coverts rose-red; wing-coverts and secondaries finely vermiculated with white and dark gray, primaries narrowly edged with white. Africa.

This trogon is found in African forests generally, but must be a rare bird in Liberia. The only record is of a male taken by Stampfli on the Junk River and recorded by Büttikofer (1886, p. 262).

PICIFORMES

CAPITONIDAE Barbets

Tricholaema hirsutum (Swainson). Hairy-breasted Toothbill

Pogonias hirsutus Swainson, Zool. Illustr., vol. 2, p. 22, pl. 72, 1821: Gold Coast.

Length about 7 inches; head and throat black, with white eyebrow stripe; back and wing-coverts black with yellowish spots, the coverts edged with same; rump, wings, and tail black with narrow yellowish edges to the feathers; breast-feathers with long hair-like prolongations of the shafts, yellowish; below yellow with round black spots. Liberia to Gold Coast.

An uncommon species of the borders of high forest. Büttikofer records four taken at Soforé Place and near Buluma, one from the Du (Stampfli), and a few from Schieffelinsville, but there are no other records nor did we meet with it. Büttikofer says it is usually seen in pairs, and appears a sluggish bird, with a monotonous song "which the survivor continues with indifference after its mate is shot." They live on insects and larvae picked from branches or from under old bark.

Gymnobucco calvus calvus (Lafresnaye). Naked-faced Barbet

Bucco calvus Lafresnaye, Rev. Zool., 1841, p. 241: Ashanti.

Size of a large sparrow, 7 inches; plain brown throughout, paler below. The crown and sides of the head are bare, and blackish blue in life. A tuft of short buffy bristles is present at the chin; bill pale. Liberia to southern Nigeria.

This peculiar bald-headed bird is generally distributed, but we did not find it anywhere common; indeed we saw less than half a dozen in all. Two of these were evidently a mated pair, and were found sitting stolidly on the dead twigs of small trees at the edge of a forest. A fledgling brought in to us at Moylakwelli, October 29, had its crown well feathered to the base of the bill, as well as the side of its head except for a bare ring around the eye and the ear opening, indicating that the bald condition of the head is acquired with later plumages.

Büttikofer regarded them as active, quarrelsome birds and records that they feed on small fruits of several kinds. Furthermore, they seem to show a remarkable colonial habit, for he found them nesting in small colonies of from four to ten pairs, making nest-holes in dead wood. Sometimes as many as three to six pairs would be found with holes in the same trunk.

Buccanodon duchaillui (Cassin). Yellow-spotted Barbet

Barbatula duchaillui Cassin, Proc. Acad. Nat. Sci., Philadelphia, for 1855, p. 324, 1856: Moonda River, Gaboon.

Length 6 inches; forehead red, throat black, a yellow stripe behind the eye; rest of body above black, spotted with yellow; wings and tail black; wing-coverts edged with yellow; breast and belly barred yellow and black, clearer yellow medially. Liberia to Lower Congo.

This is a bird of heavy forest and apparently rare. Büttikofer secured only a single pair in all his collecting in Liberia, while Stampfli obtained a single male on the Junk River. Oberholser records a third male from Mount Coffee, and Lowe obtained it at Nana Kru. All these localities are near the coast, but Whitman was fortunate enough to collect a fine male at Tappi Town near the eastern border on September 30, 1926. Many of the barbets seem to be rather lethargic in manner, going about in pairs. Thus Büttikofer speaks of the pair he saw as perching "side by side upon a twig" in a high forest tree.

Pogoniulus erythronotos (Cuvier). Red-rumped Tinker-bird

Bucco erythronotos Cuvier, Regne Anim., ed. 1, vol. 1, p. 428, 1817: Africa.

Small, about 4.5 inches long; above shining black, the rump red; a pale yellow eyebrow stripe, a similar stripe over the ear region, and a third from mouth across cheeks; a white band at base of bill; tips of middle wing-coverts yellow forming a bar; below yellowish. Senegal to Ruenzori and Portuguese Congo.

The only records are of three taken at Schieffelinsville and one at Jarjee recorded by Büttikofer (1888, p. 95) as *Megalaema atroflava.*

Pogoniulus subsulphureus chrysopygus (Shelley). Gold Coast Yellow-throated Tinker-bird

Barbatula chrysopyga Shelley, Ibis, ser. 6, vol. 1, p. 477, 1889: Gold Coast.

Small, length about 3.5 inches; black with whitish eyebrow stripe; rump, tips of wing-coverts, and edges of wing-feathers pale straw yellow; throat whitish, rest of under parts yellowish. Gold Coast to Liberia.

Like the preceding, this seems to be an uncommon species of the forest growth. Büttikofer found it, however, in the forests behind Monrovia, and secured three at Schieffelinsville and on the Farmington River, as well as others at Robertport, indicating a general distribution. Lowe secured a single specimen at Nana Kru, January 7, 1911.

Pogoniulus scolopaceus scolopaceus (Bonaparte). Speckled Tinker-bird

Xylobucco scolopaceus Bonaparte, Consp. Avium, vol. 1, p. 141, 1850: Ashanti.

Small, length 4.5 inches; black above, the feathers edged with olive yellow; throat white, rest of under side pale yellow, becoming gray at sides. Liberia to Calabar.

Although Büttikofer seems to have taken comparatively few of these birds, we found it the commonest and best distributed of the small barbets. It frequents the low growth of thickets or small trees, as well as the lower stories of the forest, but often in such dense places that it is difficult to see although its peculiar little song of a number of low *wut-wut-wut* notes may be heard. A similar song with a clearer note, and a very insect-like quality, often heard but never located, I attributed to the same or an allied species.

Trachylaemus goffini goffini (Schlegel). Goffin's Barbet

Capito goffinii Schlegel, Mus. Pays-Bas, Buccones, p. 72, 1863: Gold Coast.

Length about 10.25 inches; neck feathers bristly, black; forehead, and a broad eyebrow band, extending to neck, dull red; fore neck with a narrow, bright band of carmine; body, wings, and tail black, the wing-feathers with white inner edges; breast and middle of belly sulphur yellow, flanks black and yellow; bill deep chrome, eyes crimson. Sierra Leone to Gold Coast Colony.

We did not see this barbet, but Büttikofer speaks of finding it in pairs in "brushwood" of old plantations and says its call-note is a deep *hoop*. He took specimens at Soforé Place, Schieffelinsville, Hill Town, and Mt. Gallilee, while more recently Lowe obtained it at Nana Kru on the southern coast.

INDICATORIDAE Honey-guides

Indicator feae feae Salvadori. Fea's Honey-guide

Indicator feae Salvadori, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, vol. 20, p. 783, 1901: Farim, Portuguese Guinea.

Length about 7.5 inches, toes in pairs, two pointing forward, two back; throat white, breast darker with yellowish wash, rest of under parts whitish, washed with yellow, the flanks streaked with gray; outer tail-feathers white or with brown tips; naked eye-ring bright blue. Portuguese Guinea and Liberia.

Notwithstanding that bees seem plentiful in Liberia, the Honey-guides are certainly rare, and in general are probably birds of less densely wooded country. Büttikofer in all his field experience secured only two, the first an adult female at Soforé Place, the second, also a female, at Hill Town. These are recorded as *I. variegatus*, but this is now regarded as not belonging to the West African fauna so the specimens were presumably *I. feae*, more recently distinguished. Bannerman (1912) records *I. exilis* from Sierra Leone, probably to be identified with the subspecies *leona*, so that it may eventually be found in Liberia.

PICIDAE Woodpeckers

Campethera maculosa maculosa (Valenciennes). Golden-backed Woodpecker

Picus maculosus Valenciennes, Dict. des Sci. Nat., vol. 40, p. 173, 1826: Senegal.

A small woodpecker about 7 inches long; golden brown above, except tail which is black, and top of head which is red in the male, black with small buffy spots in female, cheeks and throat buffy with small black spots; rest of under surface of body pale yellow with transverse black bars. Senegal to Liberia and Gold Coast.

Woodpeckers are not common in Liberia, but one comes upon a pair or a single bird here and there, seldom more than one or two in a day. Of this small, dull-colored species we saw several and secured four in the general vicinity of Gbanga and Bakratown in the eastern interior, but Büttikofer records a pair and its nest in the forests behind Monrovia, as well as others at Schieffelinsville and Jarjee. They are usually unsuspicious and of lethargic movements. Those we saw were in small second-growth trees as well as in isolated trees near larger stretches of forest. They feed chiefly, perhaps almost wholly, on ants, the stomachs of those shot being crammed with a small black species of *Cremastogaster*. These live in nests forming nodular excrescences on the trunks of large trees and a bird or a pair together will often spend a long time clinging to such a nest, picking up the ants at leisure.

Campethera caroli arizelus (Oberholser). Liberian Brown-eared Woodpecker

Dendromus caroli arizelus Oberholser, Proc. U. S. Nat. Mus., vol. 22, p. 29, 1899: Mt. Coffee, Liberia.

Slightly larger than the preceding species; wings and body above golden olive, crown dark olive brown, tail black; a pale superciliary stripe; a patch behind and below the eye brown; chin, throat, chest, and abdomen dull olive with round buffy spots. Male with red crown. Liberia.

This is evidently a rare bird in Liberia. We saw but a single one, a female, in rather open primeval forest on the summit of a large hill near Banga. It was at work on a dead limb, evidently securing ants, for its stomach was filled with them, and when shot it had a black ant in its bill. Büttikofer secured an adult female at Bavia, two others at Mt. Olive and Mt. Gallilee, and others still at Schieffelinsville and Johnny Creek. He describes the crown of the female as olivaceous and the eye stripe and under wing-coverts verdigris.

Campethera nivosa nivosa (Swainson). Buffy-spotted Woodpecker

Dendromus nivosus Swainson, Birds West Africa, vol. 2, p. 162, 1837: West Africa

Resembling the last, but smaller (length about 6.5 inches); the throat streaked with brown on a whitish ground, the auriculars dull buffy instead of brown. Gambia to Angola.

This is almost a smaller replica of the last, but a much commoner species. We occasionally saw them singly or in pairs, sometimes working in a lethargic way on the dead limbs or smaller trunks, on the edges of scrub growth or on larger trees bordering cleared areas. Near Paiata, while we were ferrying our party and baggage across the St. Paul, a pair of these woodpeckers were at work on a large nodular nest of a common black ant (*Cremastogaster*) hardly twenty feet above the heads of the assembled throng of near a hundred noisy natives. The birds clung in various positions to the nest picking lazily now and then, and evidently securing an abundant supply of ants with very little exertion. They seemed almost oblivious of the disturbance, and even at the discharge of a gun started a little but presently settled deliberately back to their meal. Their actions remind one of a sapsucker in their sedentary methods of work, while the weak bill is evidently in this genus to be correlated with their ant-eating habits, for the abundance of the insects and the ease with which they may be picked up about the nests requires very little labor in excavating. Büttikofer mentions but three specimens, one of which, a male, was shot from the nest about eight feet above the ground, at Robertport.

Dendropicos lugubris lugubris Hartlaub. The Melancholy Woodpecker

Dendropicus lugubris Hartlaub, Syst. Ornith. West Afr., p. 178, 1857: Aguapim.

Small, length about 5.5 inches; forehead and rump brown, crown red; a whitish eyebrow stripe and a broad brown stripe from eye to ear and side of throat; a pale yellow spot each side of neck; wings and tail dark brown; throat white with brown triangular spots; below brown, the feathers edged with yellowish. Liberia to Gold Coast.

Büttikofer secured an adult male in the forest behind Monrovia and mentions a specimen from Robertport, and one taken by Stampfli on the Junk. There are no other records and it is evidently rare. In Sierra Leone, Thompson (1925) mentions it as uncommon in brush-country (*i.e.*, second-growth forest). We did not see it.

Mesopicus goertae poicephalus (Swainson). West African Gray Woodpecker

Dendrobates poicephalus Swainson, Birds West Africa, vol. 2, p. 154, 1837: Gambia.

A medium-sized woodpecker, about 8 inches long; head pale gray, the occiput red in the male; breast and belly gray, the latter washed with golden; back greenish yellow, rump red, tail and wings brown, the latter speckled with whitish.

Whitman and I secured an adult female of this ashy-headed species on September 5, at Gbanga. It was at work on the trunk of a small tree that stood isolated on the edge of a rice-field bordered by a few high trees. Although Bannerman has recorded it from Sierra Leone, there is apparently no previous record of it from Liberia, nor did we again meet with it.

Mesopicus pyrrhogaster (Malherbe). Fire-bellied Woodpecker

Picus (*Chloropicus*) *pyrrhogaster* Malherbe, Rev. Zool., 1845, p. 399: Sierra Leone.

Of medium size, greenish brown above, the crown (male) and rump scarlet; tail black, primaries with pale yellow spots on outer webs; a white line over eye, a black line through eye to ear; throat white bordered by a black stripe; breast and belly spotted, the center scarlet. Female with top of head black. Sierra Leone to northern Cameroons.

This handsome woodpecker seems to be confined to the forest area of West Africa north of the Gulf of Guinea. Both Büttikofer and Lowe secured it, the former in the forests behind Monrovia, the latter at Nana Kru, but they evidently seldom met with it. We saw it perhaps more often than any of the other species, particularly in the open country about Gbanga, where in clearing ground for rice-fields, the natives had left occasional dead trees too large for use as fire wood. Unlike the ant-eating *Campetheras*, this woodpecker seems to have more normal habits, and is usually seen on dead trunks picking with no great energy at the soft wood and probably obtains numerous sorts of insects. In mid-September we secured a pair at Gbanga and another male on the 19th. Both these male birds were drumming a low mellow roll of short duration, while in the first instance the female was seen busily at work on a nearby trunk, examining it for insects. A female shot November 3 at Moyla had the ovaries much enlarged as if about to lay eggs. Probably the nesting season comes late in the year as with so many birds, when the rainy season abates.

PASSERIFORMES

PITTIDAE Ant Thrushes

Pitta angolensis pulih Fraser. West Coast Ant Thrush

Pitta pulih Fraser, Proc. Zool. Soc. London, 1842, p. 190: Port Lokkoh, Sierra Leone.

Size of a robin, 7.5 inches long, with very short tail and stout legs; above blackish, the tail-coverts bright blue; a broad brownish superciliary stripe; throat pinkish white, breast olive brown, abdomen pink; tip and base of bill orange-salmon, the middle black. Sierra Leone to Gold Coast.

The ant thrush of Liberia and adjacent region is doubtless but a subspecies of typical *P. angolensis* and I have therefore ventured to regard it as such. The name is a native word, related to "umpuhli" which according to Kemp (1905) means "a voluble talker" in the Tamane dialect of Sierra Leone. No doubt the bird is of fairly general distribution over much of the country, preferring dense thickets of undergrowth, but on account of its secretive habits it is seldom seen, though its notes may often be heard, coming from apparently near at hand, though one is seldom able to locate their maker. The natives snare them by putting small nooses in openings at intervals along the little barricade fences which they often run for hundreds of feet here and there in the forest. Büttikofer obtained a few in this way, and kept two of them alive for several weeks, feeding them on the larvae of *Termes*. At Gbanga on September 15 two of a brood of young birds were brought in to us, and on the 21st, a brood of four that a native woman had caught while tending the rice-fields. Both lots were fairly well feathered, but still dependent on parental care. They kept up a soft plaintive note, *pi'-u*, somewhat like a cat's mew, and I heard a similar note on various occasions in the jungle. At Monrovia in mid-July we were shown an adult that was said to have been caught in the garden of one of the white residents.

HIRUNDINIDAE Swallows

Hirundo rustica rustica Linné. European Swallow

Hirundo rustica Linné, Syst. Nat., ed. 10, vol. 1, p. 191, 1758: Sweden.

Length 7 inches; above steely blue, the forked tail with a large white mark on inner webs of feathers; forehead and chin chestnut, belly white; a blue neck collar in the male. Breeds in northern Europe and Asia, winters in Africa and India.

The Common Swallow is one of the few European land birds that occurs regularly in Liberia on migration or as a winter resident. We saw the first ones on September 26, when a small flock of four appeared at Gbanga coursing about over the village and the open ground about it. An adult male was shot, and we saw other flocks on later occasions, in the vicinity of open country. Büttikofer says that it arrives in great multitudes at the beginning of the dry season, that is in mid-November, when the white ants are swarming, and feeds eagerly upon them. He obtained specimens along the coast, at Robertport, Paynesville, and on the Mesurado River at various times between October 12 and April 4, when they were nearly in breeding dress. Lowe found them common at Nana Kru in January.

Hirundo rustica lucida Verreaux. African Swallow

Hirundo lucida Verreaux, Journ. f. Orn., vol. 6, p. 42, 1858: Senegambia, Casamanse River.

Similar to the preceding but the upper side a more steely blue rather than the purple blue of *rustica*, the chestnut of the forehead and throat darker, the neck collar very narrow, and the white markings of the tail more extensive beginning 20 instead of 30 mm. from the base of the feather. Gambia to Stanley Falls.

The resident Africa race of the Common Swallow may be less rare than the present evidence seems to indicate on account of the difficulty of distinguishing the two in the field. The only record is that of Büttikofer, who collected a nest with three half-fledged young, April 2, 1880, on an old window seat of the Dutch "factory" at Monrovia, and conjectured it was of this race. The same author (1886, p. 248) recorded that an adult male was taken October 23 on the Mesurado River by Stampfli, but on reëxamining the specimen later he concluded (1889, p. 117) that it was the European form.

Hirundo griseopyga Sundevall. Gray-rumped Swallow

Hirundo griseopyga Sundevall, Oefv. K. Vet. Akad. Förh., vol. 7, p. 107, 1850: Port Natal.

Length about 6 inches; head dark grayish brown; a fine whitish eyebrow line; back and wings blue-black to black, rump grayish brown; tail dark grayish brown narrowly edged with white; below white, slightly washed with rusty. Abyssinia to Gaboon.

A male and a female collected at Nana Kru on January 5 and 11, respectively, by Lowe (Bannerman, 1912) are the only records for Liberia. Lowe regarded it as "not uncommon," indicating perhaps that a considerable number may winter or perhaps breed in the country.

Hirundo nigrita G. R. Gray. River Swallow; White-throated Blue Swallow

Hirundo nigrita G. R. Gray, Genera Birds, pl. 20, 1845: Africa.

A fork-tailed swallow, shining blue-black, with a white throat-spot, and square white marks on the inner vanes of all but the central tail-feathers. A small white mark at the shoulder on each side. Sierra Leone to Loango.

This beautiful blue swallow is a resident species, and offers a very fine example of a bird limited in its distribution to a particular type of environment and in its abundance by the number of available localities of that type. For it is strictly confined to the rivers, perhaps better the smaller rivers, occurring in pairs, and each pair appears to range over a limited portion of the stream centering upon the nesting location. The latter seems to be invariably a place where a fallen tree has stranded in the stream in such a way that one or two large snags or branches project from the water but are entirely isolated from the banks or from surrounding vegetation or other stranded trunks. In this comparative security the bird attaches its cup-like nest to the protected under side of the leaning snag, and so no doubt escapes ants, monkeys, and many snakes. Its tenacity in holding to the chosen spot is noted by Büttikofer, who relates that a pair built three nests in the same spot in succession when the first and second were taken with their eggs. The first set was of four eggs, complete in the first week of January; the second set was of three eggs. He records that it is frequent on the Du as far up as the Falls and we saw it there also, perhaps half a dozen pairs in all between Duport and our first camp at Plantation No. 3, a distance of some 10 miles, following the windings of the stream. The flight is easy and graceful, much like that of a barn swallow, but usually within a few feet of the water, following the course of the current. At intervals they rest, perching on the projecting stumps of stranded trees in midstream. Thompson (1925), who believes he recorded it for the first time from Sierra Leone, notes also that he saw them settle on rocks in the water.

Although Büttikofer says that he found them along all the larger rivers visited from Cape Mount to Cape Palmas, we did not notice them on the St. Paul's in the vicinity of Paiata where it is a wide rushing river at high water. No doubt, again, the distribution is dependent on just the right combination of conditions, and it is probable that the mated pairs do not go far, each from its chosen site. We failed to see them about the small streams of the interior, perhaps because these were too narrow to afford isolation from the banks even if dead trees were stranded in them.

Psalidoprocne obscura (Temminck). Sooty Rough-winged Swallow

Hirundo obscura Temminck, in Hartlaub, Journ. f. Orn., vol. 3, pp. 355, 360, 1855: Gold Coast.

A small brownish-black species, the throat grayer; the tail is squarely truncate and in the male the barbs of the outer vane of the first primary are bent back. Portuguese Guinea to Togo.

Although Büttikofer recorded this species from Sierra Leone, close to the Liberian boundary (1892, Notes Leyden Mus., vol. 14, p. 22) on the Sulymah River, and Thompson (1925) found it in immense flocks about Freetown in the same country on December 12, 1921, and for a few days after, there was no actual record of it from Liberian Territory until Lowe secured specimens at Nana Kru, January 10, 1911 (Bannerman, 1912). It is not at all rare and we saw it several times in small numbers flying about the cut-over area still partly flooded along the Du, as well as about the village of Bakratown where a small flock of six or eight birds was coursing about over the open compound at midday, often reminding one of our Tree Swallows, except that they were silent birds.

Reichenow records *P. chalybea* as occurring from Liberia to the Cameroons, a bird with steely green reflections and a forked tail, but does not say if specimens were actually taken in the country.

CAMPEPHAGIDAE Cuckoo-shrikes

Campephaga quiscalina Finsch. Steely Cuckoo-shrike

Campephaga quiscalina Finsch, Ibis, ser. 2, vol. 5, p. 189, 1869: Cape Coast Castle, Fanti.

Length 8.5 inches; above steely green shading to blue on head; wings and tail black, the feathers edged with steely green; base of bill on each side, black; sides of head and entire throat purplish violet shading to steel blue on rest of under side. Gold Coast Colony to Liberia.

This must be a very rare or accidental bird in Liberia. The only record is the old one of Büttikofer, of a male taken by Stampfli at Old Field on the Mesurado River at no great distance therefore from the coast. Another species of the genus, *C. phoenicea,* is said to occur about Freetown, on the coast of Sierra Leone (Thompson, 1925).

Coracina azurea (Cassin)

Graucalus azureus Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1851, p. 348: Western Africa.

Length 8.5 inches; blue, clearer on the head than on the back, darker on throat and sides of head; chin, fore cheeks, and a forehead-band black; wings and tail black, the feathers narrowly edged with blue; iris red, bill and feet black. In the female the blue is paler, and only the lores and nasal bristles black. West Africa, from Liberia to Congo.

This bird was described by Cassin from a specimen sent him by Robert MacDowell, a former surgeon of Sierra Leone, but although he makes no mention of its exact place of capture, this is assumed by Büttikofer to have been Liberia, since MacDowell collected numerous birds on the St. Paul's River about 1840. There are no other records for the country so that it may be considered a rare or only occasional visitor.

MUSCICAPIDAE Old World Flycatchers

Alseonax lugens (Hartlaub and Monteiro). Gray River Flycatcher

Butalis lugens Hartlaub and Monteiro, Proc. Zool. Soc. London, 1860, p. 110: Bembe, Angola.

Small, length 5.5 inches; upper side of head, the body and breast-band blue-gray, wings and tail blackish, the former slightly edged with white, the tail-feathers minutely tipped with same; throat, abdomen and under tail-coverts white. Liberia to Angola.

Like the River Swallow, this bird is strictly limited in its distribution to the shaded banks of streams and is not seen unless one makes a canoe- or boat-trip along their courses, for at high water we found it impossible to see much of the river life since the banks are thickly overgrown with vegetation in most places. During August in the course of several journeys up and down the Du, this bluish-gray flycatcher was commonly seen, and invariably in pairs, the two birds keeping near each other, and as the boat progressed up the narrow stream, they would flit on ahead flying low along the surface from the deep shadow of one bank to the overhanging thickets of the other, or keeping farther on along the same side. In a morning's canoe trip above our camp on the Du, we saw many of these little birds, and invariably a single pair together, each with its own definite area, for after flitting on ahead of the canoe for a few hundred feet they would turn and go back. There seemed to be a pair to every few hundred yards, but never more than a single pair in the same area. They perch usually close to the water on roots or branches under the shadowy overhanging vegetation along the stream bank, now and then darting out for a passing insect and either returning to the same perch or flying on to another. Alighting, they will at intervals jerk the tail upward slightly, but not sidewise as our Phoebe does; and they sit in a somewhat crouched or hunched attitude. They were apparently not breeding at the time of our visit, but Büttikofer (1888, p. 84) mentions that on February 5, he shot a pair and a young bird together with a single shot, on the Du. The young bird had the upper surface spotted with fulvous. He mentions only three other specimens secured, and notes its close association with the river banks.

Muscicapa striata (Pallas). Spotted Flycatcher

Motacilla striata Pallas, Vroeg's Cat. Verzam. Vogelen, Adumbr., p. 3, 1764: Holland.

Small, forehead and crown brown, the feathers with blackish centers and pale edges, giving a speckled effect; rest of upper parts grayish brown, chin and center of throat, and center of abdomen and the under tail-coverts white; sides of breast and abdomen streaked with brown. Breeds in Europe, winters in Africa.

Under the name *M. grisola*, Büttikofer has recorded two specimens of this European flycatcher, which though it breeds in the Atlas Mountains northward, is found elsewhere in Africa as a migrant or winter resident. It probably avoids the forested part of western Africa as a wintering place, yet a few are present at least along the coast. Büttikofer's records are of one taken at Fisherman Lake, January 3, and another at Old Field in March; Lowe secured a male at Nana Kru on the south coast, January 20, 1911, and regarded it as rare.

Platystira cyanea cyanea (P. L. S. Müller)

Muscicapa cyanea P. L. S. Müller, Linn. Natur. Syst., Suppl. u. Register Bd, vol. 1, p. 170, 1776: Senegal.

Length 5.5 inches; head, nape, back, wing-coverts and tail, shining blue-black; soft feathers of the rump gray with white spots; below white with a breast-band of shining blue-black; wings blackish, edged with white; tips of tail-feathers with white edges; a red wattle over the eye. Senegambia to Loango.

We did not meet with this flycatcher, but Büttikofer found it not uncommon in undergrowth along swamps and rivers as at Robertport, Old Field, and Paynesville; and Lowe in January secured specimens at Nana Kru and Settra Kru. Büttikofer saw it picking small caterpillars from twigs. According to Thompson (1925), it is fairly common in Sierra Leone, nesting in November and December, so it no doubt does the same in Liberia.

Diaphorophyia castanea (Fraser). Chestnut Wattled Flycatcher

Platysteira castanea Fraser, Proc. Zool. Soc. London, 1842, p. 141: Fernando Po.

Small, 4 inches long; male with head, upper back, wing-coverts, a broad breast-band, and tail, black; rump, throat, sides of head and neck, belly, and under tail-coverts white. Female with gray-brown head, the back, wing-coverts and breast-band chestnut; eye wattles purplish blue. Lower Guinea to Cameroons.

Like others of this genus, this is a thicket-haunting species. Dr. Linder shot one among thick bushy growth by the Du, which was the only one we met with, but Büttikofer in the course of his collecting secured several: a pair among underbrush near Hill Town, a male at Schieffelinsville, and others from Farmington River, Paynesville, Robertport, and the Marfa River.

Diaphorophyia blissetti Sharpe

Diaphorophyia blissetti Sharpe, Ann. Mag. Nat. Hist., ser. 4, vol. 10, p. 451, 1872: Gold Coast, Wassaw province.

Length 4 inches; throat and upper side steely blackish, rump grayish with white spotting; a reddish-brown band on side of head and neck; below white; eye lappet blue. Liberia to Togo.

The only record is that of Büttikofer who shot two adult males at Robertport. Kemp (1905), however, reports it from Sierra Leone, and it may be commoner than the evidence indicates. He says its eyelids are cobalt blue.

Diaphorophyia hormophora Reichenow. White-necked Wattled Flycatcher

Diaphorophyia hormophora Reichenow, Journ. f. Orn., vol. 49, p. 285, 1901: Angola.

Small, 4 inches; short-tailed, both sexes with black crown, back, wings, tail, and chest-band, elsewhere white on throat, neck-ring, belly, rump, and edges of remiges. Eye lappet blackish; iris red. Liberia to Togo.

An adult male, secured August 7, 1926, on the Du by Dr. Linder, is the only record for this bird in Liberia. It was taken in a bushy place near the river, apparently in much the same sort of cover as *D. castanea*.

Artomyias ussheri Sharpe. Brown Flycatcher

Artomyias ussheri Sharpe, Ibis, ser. 3, vol. 1, p. 416, 1871: Fanti.

Size of a sparrow, 5 inches long; nearly uniform blackish brown all over, except the throat which is paler and the under tail-coverts which are white-edged. Liberia to Gold Coast.

This somber little flycatcher has much the appearance of a small immature bluebird, on account of its large eyes and rounded forehead. It is uncommon, though we several times saw it. The first seen were a group of three, probably adult and young, actively catching insects in the late afternoon. Their perch was a tall dead tree by the Du River, that stood in the midst of a clearing surrounded by forest. Each bird selected as its perch one of the dead stubs of branches at perhaps fifty feet from the ground, whence it would fly out snapping up an insect and returning again to its station. Although Whitman secured another specimen at Monrovia on November 17, the only other one I saw was taken at Moala, on the 2d of the same month. It was flycatching in the same way as the others but from a low dead stub projecting from a thicket near cleared ground. Its mouth was blackish inside. The first specimen taken in late July was beginning to acquire fresh plumage, the blackish feathers of which contrasted sharply with the older faded brown portions. Büttikofer records but a single specimen, at Soforé Place on the St. Paul's River, and Oberholser reports two from Mount Coffee, on the same stream. It is a bird of open areas with a supply of dead standing timber.

Tchitrea nigriceps nigriceps (Hartlaub). Black-headed Paradise Flycatcher

Muscipeta nigriceps Hartlaub, Journ. f. Orn., vol. 3, pp. 355, 361, 1855: "Guinea."

A slender, medium-sized bird about 7 inches, with the central pair of tail-feathers slightly elongated in the male. Head and throat black with bluish reflections; primaries and secondaries black, the latter edged with orange rufous, which is the color of the rest of the plumage; feet pale lead blue; bill and eye-lids sky blue. Sierra Leone to Gold Coast.

This beautiful flycatcher is not uncommon in the dense undergrowth of high forest or in the thickets under or bordering second-growth trees, a bird therefore of shaded places, usually preferring low perches from three to ten or fifteen feet from the ground. Although we saw a good many and secured several specimens, we never heard a note from the bird. Büttikofer mentions its occasional association with small birds of other species, moving through the trees more or less in company, in search of insects. It is interesting, too, that this species which may be regarded as more primitive than other African species of the genus in the relatively slight tail development, should be the typical form of this western forest area, the home of sundry other primitive types.

Pholidornis rushiae ussheri Reichenow. Yellow-bellied Tit

Pholidornis ussheri Reichenow, Vögel Afrikas, vol. 3, pt. 2, p. 529, 1905: Gold Coast.

Size of a kinglet; head, chin, and throat finely streaked with dark brown on a whitish ground; upper back, wings, and tail dark brown, the feathers edged with olive brown; rump, belly, and under tail-coverts bright olive yellow; feet and base of lower mandible light yellow. Gold Coast to Gaboon.

The finer streaking of the throat is obvious in these birds as compared with a Cameroons specimen, so that the name proposed by Reichenow provisionally for Gold Coast birds may be regarded as valid with subspecific status. Of this very small species, there is apparently no previous record for Liberia. The two that we secured on the Du River, August 14, 1926, were a mated pair, with a newly started nest about twenty feet from the ground in some long dead vines, depending from a tree at the edge of a clearing. The female bird had a bit of soft shredded bark in her beak. We saw no others, but its small size might easily render it inconspicuous.

Fraseria cinerascens Hartlaub. Blue-gray Flycatcher

Fraseria cinerascens Hartlaub, Syst. Ornith. West Afr., p. 102, 1857: Ashanti.

A small species, 6.5 inches long; above slaty blue, darker on forehead, the wings blacker, upper breast dark gray; under wing-coverts, under tail-coverts, and a spot in front of eye, white; chin, throat, and abdomen white with gray edges to the feathers. Gold Coast to Gaboon.

This is a bird confined to a special type of locality, namely, the shaded under story of small trees and bushes at the edges of river banks. We saw them in pairs in such situations several times. The female of a pair obtained at Gbanga, September 8, had a double ovary, the left portion being about half the size of the right. These birds keep closely associated in pairs, flitting from perch to perch near the water's edge, or sometimes alighting momentarily on a fallen trunk. They seemed to prefer quiet inlets from the main stream, bordered with trees. In one such place at Gbanga, I shot a pair, and a few days later another pair had taken its place by the same pool. They seem to be very silent birds.

Fraseria ocreata prosphora Oberholser

Fraseria prosphora Oberholser, Bull. U. S. Nat. Mus., vol. 22, p. 37, 1899: Mount Coffee, Liberia.

A small flycatcher, about 6.5 inches; uniform slate color above, slightly more bluish on lower back; wing- and tail-quills brownish black, edged with slate; below grayish white; sides slate gray, feathers of breast and abdomen with narrow slate-gray tips, giving a slightly scaled effect; under tail-coverts white barred with slate. Liberia.

This seems to be a rare or inconspicuous bird, for we did not meet with it, and Büttikofer (under *F. ocreata*) has but one record of it, namely, of a female with nest and three eggs taken by Stampfli, at Schieffelinsville, Junk River, in high forest. The nest was made of fine roots and leaves. Oberholser bases this form on a specimen collected by Currie at Mount Coffee.

Trochocercus nitens reichenowi Sharpe. Slaty-blue Flycatcher

Trochocercus reichenowi Sharpe, Ibis, ser. 8, vol. 4, p. 630, 1904: Fanti.

Size of a warbler, 6 inches long; slaty blue all over except the wings which are brownish; tail proportionally long, its outermost feathers shortest. Sierra Leone to Fanti.

With its long, graduated tail, its habit of spreading and erecting it slightly, and its somber plumage, this little flycatcher reminds one of a very small catbird. One was secured at Paiata and one or two others were seen on the edges of clearings among dense growth. Büttikofer mentions three in low forest at Hill Town, and an adult at Owen's Grove; while both Kemp and Thompson record it from Sierra Leone.

Pedilorhynchus comitatus (Cassin). White-throated Flycatcher

Butalis comitatus Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1857, p. 35: Muni River, West Africa.

Size of a sparrow, 5 inches; chin, upper throat, and the belly white; breast and sides blue-gray. Head and back blue-gray, wings and tail brownish black. An indistinct whitish line before the eye. Gold Coast to Gaboon.

At Bonuta we secured a single specimen, seen in late afternoon, perched on the tip of a vine in the shade of tall trees. It was silent and rather inactive. A specimen brought in at Gbanga was too damaged to preserve. It is no doubt a thicket-dweller, and has not previously been recorded from Liberia. It is possibly closely related to *P. stuhlmanni*.

Bias musicus (Vieillot)

Platyrhynchos musicus Vieillot, Nouv. Dict. d'Hist. Nat., vol. 27, p. 15, 1818: Malimba, French Congo.

Length 6 inches; black with greenish reflections; lower side of body, under tail-coverts, and a broad band across the wing-feathers white; rump with concealed white spots; flank feathers with blackish-gray tips. Female, reddish brown. Liberia to Uganda.

Although Büttikofer found this "tolerably common in brushwood" and plantations at Robertport and Cape Mount, and Lowe found it "a striking bird, tolerably common on the Kru coast" but more plentiful in Sierra Leone, we failed to see it. Possibly it is commoner along the coast.

Megabias atrialatus (Cassin)

Dryoscopus atrialatus Cassin, Proc. Acad. Nat. Sci. Philadelphia, vol. 5, p. 246, 1851: "? Eastern Africa."

Length about 6.5 inches; above black with steely sheen, rump feathers with white tips; upper tail-coverts and entire under side white; iris red, bill black. Female reddish brown, streaked with brown below. Liberia to Congo and the Lakes.

The only record is of an adult male taken by Büttikofer (1890, p. 204), near Robertport "in brushwood." He says the feet are dark red, the iris red.

Stizorhina finschi (Sharpe)

Cassinia finschi Sharpe, Ibis, ser. 2, vol. 6, pp. 53, 474, pl. 2, 1870: Fanti.

Length 7.5 inches; above grayish brown, the rump redder, the tail darker with broad white tip; throat yellowish, rest of underside reddish brown. Liberia to Gold Coast.

This is another uncommon species for which the only records are: an adult male and female taken in low forest near Hill Town by Büttikofer (1888, p. 86) and a male from Schieffelinsville (Büttikofer, 1889, p. 122).

Parisoma plumbeum (Hartlaub)

Stenostira plumbea Hartlaub, Journ. f. Orn., vol. 6, p. 41, 1858: Senegambia, Casamanse River.

Length 5.5 inches; above gray, feathers of crown with dark shaft stripes, a white line above and another below the eye, and a dark-gray spot before the eye; below, pale gray, chin and middle of belly white; middle tail-feathers black, the outer ones with white ends, in the outermost occupying the terminal half of the feather. Senegambia to southeastern Africa.

The only known occurrences of this species are the two records furnished by Büttikofer, namely, one shot at Monrovia by Stampfli and another secured by the same collector in brushwood, at Old Field, on the Mesurado River.

EURYLAEMIDAE Broad-bills

Smithornis rufolateralis G. R. Gray. Rufous-breasted Broad-billed Flycatcher

Smithornis rufolateralis G. R. Gray, Proc. Zool. Soc. London, 1864, p. 143, pl. 16: West Africa.

Size of a sparrow; top and sides of head and the tail black; back black, the feathers with concealed white bases; wings olive, the major coverts with two rows of white spots; a large rufous area on each side of breast in front of bend of wing; remainder of under parts whitish with black streaks. Female duller, head olive.

This is a bird confined to the West African forest area from Cameroon, north to Sierra Leone. It seems, however, to be uncommon and is a species of the forest undergrowth. The only one we saw was secured at Bonuta, October 3; it was actively catching flying insects from a perch on the branch of a low tree over a small shaded stream. Büttikofer, who secured two adult males near Hill Town and Weflah and a third at Mt. Gallilee likewise found them only in the dense undergrowth of high forest and speaks of their habit of flying up for passing insects and returning to the same perch; their cry, he says, is a harsh *kerr*, *kerr*, like that of a *Dendrohyrax*. A comparison of our bird with others from the Cameroons reveals no tangible differences.

PYCNONOTIDAE Bulbuls

Criniger verreauxi Sharpe

Criniger verreauxi Sharpe, Cat. African Birds, p. 21, 1871: Fanti.

Length 8 inches; head grayish brown, sides paler and finely streaked with whitish; body olive green, tail reddish brown edged with olive green; belly and under tail-coverts yellow, sides olive. West Africa.

The few available records seem to indicate that this is an uncommon species. Büttikofer secured but four, from Schieffelinsville, Hill Town, and Jarjee, and

Lowe found it at Nana Kru (Bannerman, 1912), while Chubb (1905) adds another record from St. Paul's River. It is a bird of the forest undergrowth. It will probably prove to be a race of *C. calurus.*

Criniger barbatus (Temminck)

Trichophorus barbatus Temminck, Pl. Col., pt. 15, pl. 88, 1821: Sierra Leone.

Length 9 inches; crown greenish gray, body olive green, tail olive brown to rusty, sides of of head white-streaked; throat pale yellow, breast gray, belly olive green, under tail-coverts yellowish. Gambia to Niger.

Like the preceding, a rare bird. Büttikofer's records are: Soforé Place in high forest and brushwood; Schieffelinsville, a male, Hill Town, Jarjee, and Johnny Creek. We did not meet with it.

Stelgidillas gracilirostris liberiensis (Reichenow)

Andropadus gracilirostris liberiensis Reichenow, Novit. Zool., vol. 2, p. 160, 1895: Liberia.

Size of a thrush; above olive green, forehead and cheeks grayer; tail darker olive brown than the back, the feathers edged with olive green, wing-feathers with inner edges ochraceous; below, the chin is white, throat and belly grayish faintly tinged with pale yellow, under wing-coverts ochraceous; iris red. Senegambia to Congo.

This is a bird of the dense thickets, and seldom seen. The only one we saw was brought in by a native at Bangah, October 26. It was in an abnormal condition of moult, with the rectrices of the left wing missing and the feathers of the left ventral feather tract just coming in. Büttikofer reported it from Buluma and Robertport as well as Schieffelinsville, and the Junk River, while Lowe was fortunate in securing specimens from Nana Kru, Settra Kru, and Subono on the south coast. Oberholser, who records a specimen from Mount Coffee, April 1, with the moult still in progress, erected for this species the genus Stelgidillus, and Chubb in his list includes the bird twice, as *S. liberiensis* and *Chlorocichla gracilirostris.*

Stelgidillas latirostris congener (Reichenow). Yellow-whiskered Bulbul

Andropadus congener Reichenow, Journ. f. Ornith., vol. 45, p. 45, 1897: Togo, Agome Tongbe.

Size of a sparrow; above, dark olive, the rump tinged with rusty, the tail dusky brown; a short blackish stripe from corner of mouth to ear, below which is a contrasting yellow stripe on each side; center of chin and the throat olive green, belly paler; under tail-coverts olive, tinged with rusty, feet and tip of bill pale yellowish. Senegambia to Gold Coast.

This bulbul is one of the most characteristic birds of the dense forest, where it inhabits the lower story of tree growth. It is a persistent singer, and often in the course of a day's march through the wooded country, its monotonous song is almost the only sound that breaks the stillness of noon-day. The song is a series of modulated "chirroups" reminding one a little of the notes of a House Sparrow, but fuller-toned, less harsh, the notes following one another in various tones. Its characteristic perch is in a clump of dense vines depending from a tree at about a height of forty feet, under taller forest trees. Here in the thickest part of the vines, the bird perches concealed and sings regularly at brief intervals. At Bomboma, where a wild fig tree had fallen in an opening in the forest, we saw several of these shy birds come in to feed on the small fruits with which the tree was laden.

Andropadus gracilis Cabanis. Gray-throated Bulbul

Andropadus gracilis Cabanis, Orn. Centralbl., 1880, p. 174: Angola.

Size of a sparrow; top of head dark brownish olive, back bright olive green, upper tail-coverts washed with rusty; tail brownish with rusty wash; throat gray, merging into the olive-green breast and flanks; center of belly tinged with bright yellow. Like *A. virens* but smaller, and belly yellower. Sierra Leone to Angola.

We secured several specimens at Paiata and at Bakratown, at the latter place a female on September 30, that contained an egg nearly ready for extrusion. Its stomach held fruit seeds. This species is not mentioned by Büttikofer who nevertheless may have confused it with *A. virens* or some other species.

Andropadus curvirostris Cassin

Andropadus curvirostris Cassin, Proc. Acad. Nat. Sci. Philadelphia, p. 46, 1859: River Camma, West Africa.

Length 6.5 inches; bill narrower than distance from tip to nostril; above brownish olive green, head darker, tail redder; below pale olive green, breast and sides tinged with rusty, throat grayer, belly pale yellow. Liberia to Loango.

This is recorded from Robertport, Jarjee, and Schieffelinsville by Büttikofer who at first confused it with *A. virens* but later distinguished it by its dark-greenish or brownish-gray instead of ochraceous flesh-color feet.

Andropadus virens Cassin. Olive-green Bulbul

Andropadus virens Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1857, p. 34: Cape Lopez and River Muni, West Africa.

Size of a song sparrow; body above and below uniform olive green, the wings and tail brownish black with a faint rusty tinge; upper tail-coverts brownish; a yellowish wash over center of belly. Female slightly smaller. Gambia to Congo.

This is a common and characteristic, if shy, thicket bird throughout the region. It frequents the densest tangles of thick, bushy growth, and thus is very difficult to see, and it was a long while before I succeeded in connecting it with its song so frequently heard. It usually keeps within six to ten feet of the ground, moving in and out among the dense masses of twigs and leaves, and often though the bird is singing within a few feet I have been quite unable to see it even after prolonged watching. Sometimes it may be seen unawares, sitting quietly on a low perch, or again, if one keeps perfectly quiet, it may be briefly glimpsed peering through the twigs. But usually it seems to be quite aware of one's presence and eludes the most patient watching. In these thickets it is impossible to move without a noise so the difficulty is increased. As one walks along the forest trails it seems often as if the bird followed close at hand, keeping out of sight in the thick cover, but frequently uttering its characteristic song, which begins with a low explosive four-note chuckle, then a brief pause, followed by a short warble of clear notes sometimes ending with a whistle on an upward slide. We secured a fledgling at Totokwelli on October 29. An adult taken at Kassata had fruit seeds in its stomach.

The Liberian birds are probably referable to the subspecies *grisescens* Reich., type locality "Oberguinea," which differs from the Cameroon birds in its darker tone and less yellow belly. Oberholser places the bird in the genus *Eurillus* and records an immature male from Mount Coffee in the plumage described by Hartlaub as *A. erythropterus*.

Ixonotus guttatus J. and E. Verreaux

Ixonotus guttatus J. and E. Verreaux, Rev. et Mag. Zool., ser. 2, vol. 3, p. 306, 1851: Gaboon.

Length 7 inches; above pale olive brown, the feathers of head scale-like, edged with darker; rump feathers black, tipped with yellowish; white spot before eye, sides of head white-streaked; below white washed with yellow; four outer tail-feathers white, edged with yellow. Liberia to Loango.

The only records are those of Büttikofer, of two from Schieffelinsville and two from Mt. Gallilee, taken in "brushwood." He says the iris is white and the edges and basal half of lower mandible whitish.

Bleda syndactyla (Swainson)

Dasycephala syndactyla Swainson, Birds West Africa, vol. 1, p. 261, 1837: Sierra Leone.

Length 8 inches; above, olive brown, the rump slightly redder; cheeks bordered below by a blackish stripe; tail reddish brown; below, yellow, sides olive green; iris red, feet gray. Senegambia to Loango.

Büttikofer records several birds from Schieffelinsville, Hill Town, and Soforé Place, and Oberholser had a bird from Mount Coffee. According to the former it is a bird of dense undergrowth in virgin forest and a good singer.

Bleda eximia (Hartlaub)

Trichophorus eximius Hartlaub, Journ. f. Orn., vol. 3, pp. 356, 360, 1855: Dabocrom, Gold Coast.

Length 8.5 inches; above olive green, head darker than back; cheeks with a blackish stripe; spot before eye pale yellow; below yellow; three outer tail-feathers with yellow tips. Sierra Leone to Gold Coast.

Büttikofer again is the only authority for this species. He secured specimens at Schieffelinsville, Hill Town, and Soforé Place in high forest and the thickets of abandoned plantations.

Bleda canicapilla (Hartlaub). Yellow-bellied Bulbul

Trichophorus canicapillus Hartlaub, Journ. f. Orn., vol. 2, p. 25, 1854: Sierra Leone, Gambia.

Size of a catbird, 9 inches; head blue-gray, back and tail olive; chin, throat, breast, belly, and under tail-coverts bright yellow, the sides of breast, and flanks and tibiae olive; three outer tail-feathers tipped with yellow; bill and feet pale blue-gray. Senegambia to Togo.

This is a thicket dweller, frequenting the undergrowth of high forest or the dense jungles of swamps, and though probably more common than the few specimens taken might indicate, it is rarely seen, a shy and secretive bird. Büttikofer notes that it is a good singer, and secured several specimens. We secured an immature male on October 19 at Kolobanu, that was partly in juvenal dress, with the head, back, and upper breast chocolate brown.

Calyptocichla serina (J. and E. Verreaux)

Criniger serinus J. and E. Verreaux, Journ. f. Orn., vol. 3, p. 105, 1855: Gaboon.

Length 8 inches; above yellowish olive green; pale gray before the eye, the ear region grayish green with fine white shaft stripes; throat whitish, rest of under side bright yellow; bill reddish brown. Liberia to Loango.

Büttikofer's record of a specimen taken at Schieffelinsville is the only basis for including this species.

Phyllastrephus albigularis (Sharpe)

Xenocichla albigularis Sharpe, Cat. Birds Brit. Mus., vol. 6, p. 103, pl. 7, 1881: Fanti.

Length about 7 inches; above olive green, browner on head, the tail rusty; sides of head gray; wings dark brown edged with olive; chin white, breast white washed with yellowish, rest of lower side white. Sierra Leone to Congo.

An adult male collected at Jarjee, a Golah town up the Marfa River, is the only record (Büttikofer, 1890, p. 203).

Pycnonotus barbatus inornatus (Fraser). Common Bulbul; "Pepper-bird"

Ixos inornatus Fraser, Proc. Zool. Soc. London, 1843, p. 27. Cape Coast Colony, West Africa.

Size of a thrush; above olive brown, slightly darker on head, and blackish on tail; throat like back; belly and under tail-coverts pure white. West Africa.

Although Reichenow believed this race not distinguishable, it seems slightly smaller than typical *barbatus* from North Africa. This is a familiar bird everywhere in somewhat open country, and around villages and clearings. Its clear notes, with characteristic interruptions, are among the first bird voices that one hears in the early morning. The birds feed eagerly on small fruits of various kinds, and from their fondness for the small scarlet pods of pepper are often called Pepper-birds.

Atimastillas simplex (Hartlaub)

Trichophorus simplex Hartlaub, Journ. f. Orn., vol. 3, pp. 356, 360, 1855: Rio Boutry.

Length 8.5 inches; dark olive brown above, lores blackish, a narrow white line on upper and lower eyelids; chin and throat white, breast olive brown, center of belly pale buffy, flanks olive, tinged with rusty; under wing-coverts, inner edges of remiges, tips and inner edges of outer tail-feathers ochraceous. Portuguese Guinea to Congo.

An uncommon bird of which we secured a single specimen only, at Gbanga. Büttikofer records it from Robertport and Schieffelinsville and Lowe collected it at Settra Kru.

Phyllastrephus baumanni Reichenow

Phyllostrephus baumanni Reichenow, Orn. Monatsb., 1895, p. 96: "Misahöhe"; fig. in Jour. f. Orn., vol. 45, pl. 2, fig. 1, 1897.

Length 7 inches; above olive brown, the tail and rump slightly more rusty; tail graduated, its outer feathers 16 mm. shorter than the central ones; chin soiled white, breast and belly olive gray, clearer in center of belly; under wing-coverts pale yellow; inner edges of remiges pale buffy; lower mandible and feet pale gray.

A bird that corresponds perfectly with Reichenow's description of this species was taken at Paiata on October 14, and seems to extend the known range of the species considerably to the northward. Like others of this group it is probably a bird of thick growth, seldom seen.

Phyllastrephus icterinus (Bonaparte). Yellow-bellied Bulbul

Trichophorus icterinus Bonaparte, Conspec. Avium, vol. 1, p. 262, 1850: "Guinea."

Length 6 inches; top of head, the wings and back bright olive green; upper tail-coverts washed with rusty; tail reddish brown, the outer edges narrowly olive green; inner edges of wing-feathers pale buffy; throat, middle of breast, and belly bright yellow, flanks olive; iris buffy. Liberia to Gaboon.

This is a thicket dweller, of inconspicuous coloration, and difficult to find. We secured single specimens on the Du and at Paiata on the St. Paul's River, one of them with the remains of a large caterpillar in its stomach. Büttikofer records but one, taken "in brushwood" near Hill Town. This is the *Pycnonotus tricolor* of Chubb's list.

Phyllastrephus leucopleurus Cassin. White-bellied Bulbul

Phyllostrophus leucopleurus Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1855, p. 328: Moonda River, West Africa.

Size of a mockingbird, 10 inches; above olive brown, grayer on head; chin white, throat and breast olive, the feathers with gray central streaks; belly and under tail-coverts white, washed with yellow; tail like the back but the four outer feathers on each side with broad white tips. Senegambia to Congo.

This fine vigorous bird is common along waterways and especially in swamps with a dense growth of jungle mixed with Raphia palms whose roots prefer water to stand in. They are excellent singers and especially toward evening keep up a loud conversational type of song from the thickets. At one place on the Du River we saw three in pursuit flight, but as on other occasions, they dashed instantly for shelter on perceiving us.

Baeopogon indicator (J. and E. Verreaux). White-tailed Bulbul

Criniger indicator J. and E. Verreaux, Journ. f. Orn., vol. 3, p. 105, 1855: Gaboon.

Size of a small thrush, 7.5 inches; above, olive green, sides of head and throat blue-gray, the breast similar but with an incomplete band of olive green; belly pale buff, flanks olive; central tail-feathers blackish, the four outer ones white with brownish-black tips. Iris buffy. Sierra Leone to Congo.

This is a forest species, of which we saw but a single pair at Bonuta and secured the male. One bird was pursuing the other among the branches of the forest trees at some fifty feet from the ground. Büttikofer records it from Schieffelinsville, Junk River, and from Jarjee, Marfa River, and notes that the male is the larger. Lowe procured it on the south coast at Settra Kru.

TURDIDAE Thrushes

Neocossyphus poensis (Strickland)

Cossypha poensis Strickland, Proc. Zool. Soc. London, p. 100, 1844: Fernando Po.

Length 8.5 inches; above slaty, darkening on rump; throat pale brownish gray, rest of under side reddish brown, outer tail-feathers white-tipped. Sierra Leone to Gaboon.

A rare species "met with now and then in narrow bush paths and thickets" by Büttikofer who secured specimens from Soforé Place (St. Paul's River), Junk River, and at Schieffelinsville.

Cossypha verticalis Hartlaub

Cossypha verticalis Hartlaub, Verz. Hamb., p. 23, 1850: Elmina.

Length 8.5 inches; crown black, occiput white; neck-ring, entire under side, under wing-coverts, and rump reddish brown; back and wings dark slaty, wings edged with gray; middle tail-feathers brownish black, others reddish brown, the outermost edged with brownish black. Senegal to White Nile.

The only records are those of Büttikofer of one taken at Robertport and another "caught in a snare in brushwood along a swamp" (no locality given).

Bessonornis cyanocampter Bonaparte. "Pay-tay"

Bessonornis cyanocampter Bonaparte, Consp. Avium, vol. 1, p. 301, 1850: No locality.

Length 6.5 inches; head black above with a long white eyebrow stripe; back olive, upper tail-coverts rusty; wings black with bright blue at the bend; chin and throat orange paling to yellow on the abdomen. Tail rusty except central pair of feathers and outer edge of outer feather of each side which are black. Liberia to Gold Coast.

Büttikofer found this rare, and records only one from the Du and an adult female from Mt. Gallilee. Along the St. Paul's River, as at Paiata, however, we found it more common but exceedingly difficult to catch a glimpse of as it haunts the densest tangles of vines and bushes in swampy places, where the abundance of thorny branches and interwoven razor-like stems of the Scleria grass make it impossible to move without noise. The native name is said to have reference to its loud clearly modulated whistling notes, first high then low in the scale, with an almost human quality. It is in some degree a mocker, one I heard imitating the opening notes of a *Prinia's* song. By imitating these the bird may often be drawn close, and may reply in a challenging manner, but so secretive is it that one may seldom get more than a fleeting glimpse of it as it darts across a small opening into the leafy tangles again. The only specimen taken was called in this way, as it alighted momentarily on a low branch at the edge of a stream.

Erythropygia leucosticta (Sharpe)

Cossypha leucosticta Sharpe, Cat. Birds Brit. Mus., vol. 7, p. 44, 1883: Gold Coast, Accra.

Length 6.5 inches; above olive brown shading to reddish brown on rump; a black band above the white eyebrow stripe and another below it; ear region gray; breast buffy brown, belly white. Liberia to Gold Coast.

Büttikofer gives the description of a nestling received from a native at Hill Town as the only record for this species.

Turdus pelios lugubris Boddaert

Turdus lugubris Boddaert, Tabl. des Pl. Enlum., p. 33, 1783: Senegal.

Length 9 inches; above grayish brown; throat white, finely streaked in the middle with brownish; breast pale grayish brown washed at the sides with rusty; belly and under tail-coverts white, the lateral coverts edged with grayish. Senegambia to Liberia and the Gold Coast.

The only thrush to be recorded from Liberia is apparently rare for the single record is that of Büttikofer who secured an adult female at Grand Cape Mount. Lowe, who collected two in Sierra Leone, notes that his attention was first attracted by their habit of turning over dead leaves in feeding.

Saxicola rubetra (Linné). The Whinchat

Motacilla rubetra Linné, Syst. Nat., ed. 10, vol. 1, p. 186, 1758: Sweden.

Length 5.5 inches; streaked blackish brown and rufous above; a prominent white eyebrow stripe in the male, a buffy one in the female; sides of head blackish brown; chin, throat, and sides of breast buffy, belly white; tail dark brown, the basal fourth of central and half the other feathers white. Europe, wintering in Africa.

This European species is well known to be a common winter bird in open places over parts of Africa, but since it avoids forest country, Liberia is somewhat outside of its winter range. In Sierra Leone, Kemp (1905) records it in January, February, and April at Bo and Thompson (1925) found it common in the more open interior of the same country. Büttikofer recorded a male in breeding plumage, probably on its way north, from the Sulymah River, Sierra Leone, very close to the Liberian border, but the only record for the country is that of Chubb (1905) of an adult female taken on the St. Paul's River, January 16, 1905.

TIMALIIDAE Timaliines

Illadopsis fulvescens (Cassin). Brown Ant-thrush

Turdirostris fulvescens Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1859, p. 54: River Camma, West Africa.

Length 6.5 inches; above olive brown, the tail clear dark brown, its feathers edged with rusty; rump rusty; cheeks gray; chin white, rest of under side rusty olive; lower mandible and feet blue-gray. Liberia to Angola.

Büttikofer records the capture of but three specimens of this bird in all the time of his collecting in Liberia, namely, one at Hill Town, a male from Mt. Olive, and a third bird from Robertport. Yet it is a common species in the forested part of the country. Its habits are, however, extremely retiring and it inhabits the densest undergrowth of forests where it is remarkably secure from the collector. Dr. Linder and I while scrambling through the tangles on a steep hillside under primeval forest trees near the Du River, came upon a fledgling, which with some difficulty we captured. The parent birds at first were much disturbed, uttering a wren-like chatter in protest, but though constantly flitting in and out among the thick growth, would not show themselves for but a fraction of a second through the twigs. The young bird as well as the adults kept either on the ground or close to it, and the latter presently withdrew. This was on July 28 at the height of the rains. An adult was secured at Paiata in dense scrub. Reichenow notes that this bird feeds on driver ants whose long armies it follows in the forest.

Illadopsis gularis Sharpe

Illadopsis gularis Sharpe, Ibis, ser. 2, vol. 6, p. 474, 1870: Elmina, Fanti.

Length 7 inches; dull yellowish brown above becoming gray on forehead; rump more rusty, wing-feathers edged with rusty; below pale yellowish brown, sides rusty, abdomen white; tail olive brown edged with rusty. Portuguese Guinea to the Congo.

We did not meet with this larger species but Büttikofer records three taken in the course of his explorations: one in the graveyard at Monrovia, and two others at Schieffelinsville. Like all the genus it is to be looked for in dense undergrowth.

Illadopsis rufescens (Reichenow)

Turdirostris rufescens Reichenow, Journ. f. Orn., vol. 26, p. 209, 1878: Liberia.

Like *T. fulvescens,* but larger, with a reddish tone to the upper side and crown, and white below.

Nothing seems to have been added to our knowledge of this species since it was originally described by Reichenow on the basis of a bird collected in Liberia by Schweitzer.

Phyllanthus atripennis (Swainson). Black-winged Babbler

Crateropus atripennis Swainson, Birds West Africa, vol. 1, p. 278, 1837: Senegal.

Size of a starling, 9 inches; head gray, the feathers dark brown at the base edged with gray; rest of plumage brown, becoming nearly black along the border of the gray throat and occiput; tail black, bill pale. Senegambia to Liberia.

At Paiata two of these birds were brought in that had been snared by the natives, and we later saw one among low bushes on the edge of a rice-field, but in general it seems uncommon and retiring. Büttikofer mentions specimens from Cape Mesurado, Robertport, Schieffelinsville, Mt. Olive and Mt. Gallilee, but nothing is recorded of its habits in the country.

Geocichla princei (Sharpe)

Chamaetylas princei Sharpe, Proc. Zool. Soc. London, 1873, p. 625: Denkera, Fanti.

Length 8 inches; above olive brown, becoming rusty on rump; spot before eye, cheeks and chin white to buffy; on ear region a buffy band bordered above and below by black; breast and sides yellowish brown, belly white; tail olive brown tipped with white. Liberia to Gold Coast.

An immature female taken by Büttikofer on the Du was at the time the second known specimen, and stands today the only record for Liberia.

Alethe johnsoni (Büttikofer)

Drymocataphus johnsoni Büttikofer, Notes Leyden Mus., vol. 11, p. 97, 1889: Hill Town, Liberia.

Similar to *A. cleaveri* but darker, wings less rufous, chest and fore neck ashy gray.

Büttikofer records as *Drymocataphus cleaveri* a specimen from Hill Town (Büttikofer, 1888, p. 77), that he later (1889b, p. 97) made the type of a new species (*johnsoni*). There are no other records.

Alethe poliocephala castanota Sharpe

Alethe castanota Sharpe, Cat. Afr. Birds, 1871, p. 20: Fanti.

Length 6 inches; above, body and wings chestnut; crown brownish gray, eyebrow stripe whitish; below buffy, washed at sides with yellowish brown; chin and belly white; feet yellowish. Sierra Leone to Gold Coast.

We did not meet with this thicket-haunting species, but Büttikofer found it at Soforé Place, Schieffelinsville, and Mt. Gallilee, in dense growth at edges of clearings, keeping close to the ground.

Alethe diademata (Bonaparte). Chestnut-crowned Thrush

Bessonornis diadematus Bonaparte, Conspect. Avium, vol. 1, p. 302, 1850: Guinea.

Size of a small thrush, 7 inches; crown orange-chestnut, back and wings olive brown; tail black, the outer feathers tipped with white on the inner vanes; cheeks and sides of neck and throat gray, nearly forming a collar on breast, rest of lower parts white. Portuguese Guinea to Togo.

This is a bird seldom seen on account of its extreme wariness and the difficulty of penetrating the dense thickets in the forest where it lives. Büttikofer notes two in high forest near Schieffelinsville and an adult and young in low forest near Hill Town, while Lowe secured a specimen at Nana Kru in very dense bush. In addition to a specimen from the Du River, we secured a female and downy young at Paiata, October 5th. Its nest was in a hole in the side of a dead stump about four or five feet from the ground in a swampy place among bushes. The nest was made of fine black rootlets and green moss, lined with more rootlets and a leaf or two of mimosa. The three nestlings were still very small and sparsely covered with fine sooty down, which, as they cuddled together in the nest, fluffed out to cover them completely. Their skin was dark and the corners of their mouths white. After discovering the nest, and seeing no sign of the parent birds, I waited in the shelter of a bush some yards away for over half an hour before the old ones appeared, but so wary and suspicious were they, that it was some while before one ventured to visit the nest for a second; in spite of my concealment and motionless posture, they were quite aware of my presence, and kept hidden among the dense foliage near the ground for a long while, flitting back and forth before affording a chance to shoot.

NECTARINIIDAE Sun-birds

Cinnyris superbus (Shaw). Chestnut-bellied Sunbird

Certhia superba Shaw, Gen. Zool., vol. 8, pt. 1, p. 193, 1811: Malimba, French Congo.

A large species, about 5.5 inches long; male with top of head steely blue, rest of upper side iridescent green; wings and tail black; throat iridescent violet; belly and under tail-coverts dark chestnut red, the sides and middle of abdomen more or less black. Female dark gray-brown above washed with olive green, below dark yellowish gray. Gold Coast to Angola.

This large and handsome sunbird does not seem to have been previously recorded for Liberia. Coolidge shot one of a pair seen perched in a low tree near Gbanga and I took an adult male with enlarged testes, October 24, at Banga. Comparison with Cameroon specimens reveals no essential differences.

Cinnyris johannae J. and E. Verreaux. Red-bellied Sunbird

Cinnyris johannae J. and E. Verreaux, Rev. Mag. Zool., ser. 2, vol. 3, p. 314, 1851: Gaboon.

Slightly smaller, about 4.5 inches: male green above with steely blue reflections and similar on head and upper throat; a shiny purple band across the breast; abdomen scarlet; a tuft of concealed yellow feathers on each side of breast; belly and under tail-coverts black. Female dull olive green above, tail blackish; below white, finely streaked with black and washed on breast and belly with yellow. Sierra Leone to Congo.

This is an uncommon species of which Büttikofer in the course of his collecting secured only three, at Schieffelinsville and on the Junk River. Oberholser records one from Mount Coffee and Lowe collected it at Nana Kru. We can add an adult female from Paiata and a male taken by Whitman at Tappi Town on the eastern border. Kemp (1905) speaks of it as haunting the tallest flowering trees in Sierra Leone. Our female specimen is less yellow below than one from the Cameroons.

Cinnyris venustus venustus (Shaw)

Certhia venusta Shaw, Naturalist's Misc., vol. 10, pl. 369, 1799: Sierra Leone.

Small, 4 inches long; above bright green, forehead with bluish reflections; chin black, throat black with green, blue, and violet reflections, belly yellowish; a tuft of orange-yellow feathers on side of breast. Female smaller, grayish brown above, throat and breast yellowish. Senegambia to Gaboon.

This sunbird was found commonly by Büttikofer and Stampfli at various localities, as Schieffelinsville, Robertport, and on the Junk, Marfa, Du, and Mesurado rivers, and by Lowe at Nana Kru and Subono on the south coast, but curiously we missed it altogether. Thompson (1925) regards it as probably the most common sunbird about Freetown, Sierra Leone. Possibly it is less abundant in Liberia during the rains which was the season of our visit.

Cinnyris chloropygius kempi Ogilvie-Grant. Green-backed Sunbird

Cinnyris kempi Ogilvie-Grant, Trans. Zool. Soc. London, vol. 19, p. 329, 1910: Sierra Leone.

Size of a kinglet, 4 inches; male with metallic-green back and throat, wings and tail blackish brown; a red band across breast, and a tuft of yellow feathers at each side of breast; belly olive brown. Female olive above, breast and belly pale yellow, throat yellowish gray. Senegambia to Niger.

This is the most abundant and familiar of the sunbirds, coming freely into the gardens to visit the flowers or flowering trees, but in general keeping among the lower growth. Büttikofer found it the commonest species at various localities along the coast, as Robertport, Cape Mount, and Schieffelinsville; Oberholser has recorded it from Mount Coffee, Bannerman from the south coast as at Nana Kru and Settra Kru, and we found it common in open places and edges of clearings at various localities in the interior. Some that we watched in a garden at Monrovia seemed fond of the greenish inconspicuous flowers of the manioc as well as the red blossoms of *Hibiscus* and a smaller orange and yellow flower with long exserted stamens. The last seemed especially well adapted for cross-fertilization by these birds but I could not see that this took place, for the birds usually fed from behind the corolla, standing on its stem and putting their bills into the cup, or sometimes standing below it or hovering momentarily before it. Büttikofer mentions nests with eggs, usually two or three in number, in the middle of November.

Cinnyris kruensis Bannerman

Cinnyris kruensis Bannerman, Bull. Brit. Orn. Club, vol. 29, p. 23, 1911: Kru Coast of Liberia.

Allied to *C. batesi* of the Cameroons, but smaller, with shorter bill, and yellowish underparts; tail olive brown washed with green, instead of dark brown; length 94 mm. (3.75 inches).

This recently described species is based on a pair of adults taken at Nana Kru and Sekondi by Lowe. We did not identify it.

Chalcomitra fuliginosa (Shaw)

Certhia fuliginosa Shaw, Gen. Zool., vol. 8, pt. 1, p. 222, 1811: Malimba, French Congo.

Length about 5 inches; chocolate brown, darker below; forehead reflecting violet blue, the throat violet red; upper tail-coverts coppery; a tuft of yellow feathers on each side of breast. Female paler brown, without the prismatic reflections or the breast tufts. Senegambia to Congo.

This seems to be one of the less common species, and although a few were taken by Büttikofer near Monrovia and at Robertport, Schieffelinsville, and on the Junk River, and by Lowe on the south coast at Nana Kru and Subono in January and February and March, we did not see it. The former writer speaks of seeing it visit a flowering silk-cotton tree, and it may possibly vary in abundance locally with the flowering of various forest trees. Such a habit together with its seeking the flowers of tall trees would render it hard to secure.

Chalcomitra adelberti adelberti (Gervais)

Cinnyris adelberti Gervais, Mag. de Zool., vol. 3, pl. 19, 1834: Senegal, Tinan.

Length 4.5 inches; crown and stripe on side of throat shining coppery green; throat and rest of upper side black, wings and back washed with reddish; throat yellowish brown bordered by a black band; belly reddish brown. Female brown above tinged with olive; below pale yellowish streaked with brown. Senegambia to Gold Coast.

This is apparently another uncommon species, which may vary seasonally in its abundance. Stampfli collected it on the Junk River in manioc farms and at Mt. Olive and Schieffelinsville, while Lowe obtained it in the early part of the year (the dry season) on the south coast at Nana Kru.

Cyanomitra obscura guineensis Bannerman. Olive-green Sunbird

Cyanomitra obscura guineensis Bannerman, Bull. Brit. Orn. Club, vol. 41, p. 135, 1921: Nana Kru, Liberia.

Length about 4.5 inches; olive green above in both sexes, below greenish washed with yellow, the male with a small tuft of bright yellow feathers on each side of breast. Edges of mandibles at base yellow to orange. Sierra Leone and Liberia.

The dull olive-green dress of this species, and the essential similarity in color of both sexes indicate that this is a rather primitive type of sunbird with relatively unspecialized plumage. It is one of the commonest species, inhabiting low bushy growth as well as the high flowering trees. We obtained specimens at nearly all points across Liberia; other collectors also regard it as common. Two males taken July 27 had enlarged testes (about 5 mm. long) and may have been breeding, but another from Banga, October 22, had them very small. An immature bird from Paiata, October 10, had the belly brighter yellow than adults, and the base of the bill a brighter orange. Cameroons birds are larger and the yellow at the edges of the base of the bill is more extensive as Bannerman has pointed out. Dr. Theiler found one alive, caught in a spider web.

Cyanomitra verticalis verticalis (Latham). Green-headed Olive Sunbird

Certhia verticalis Latham, Index Orn., vol. 1, p. 298, 1790: "Africa."

Length 5.5 inches; head and throat steely green, the throat bluer; spot before eye black; body above olive green; below, including the under wing- and tail-coverts gray; a tuft of pale yellow feathers on each side of breast. Female with entire under side pale gray. Senegal to Angola.

This is one of the rarer species, which we failed to find although Büttikofer secured specimens at Robertport, Monrovia, and the Junk River, and Lowe obtained it on the Kru coast at Nana Kru and Subono. It seems to be more common in the less rainy country immediately north and east of Liberia, for Kemp (1905) includes it as not an uncommon species in southeastern Sierra Leone and Thompson (1925) found it similarly frequent about Freetown, Sierra Leone. The former writer notes its fondness for clumps of banana trees, whence its local name of Banana Sucker.

Cyanomitra cyanolaema (Jardine and Fraser). Smoky Sunbird

Nectarinia cyanolaemus Jardine and Fraser, Contr. Orn., p. 154, 1851: Fernando Po.

Larger, length 5.5 inches; male sooty above and below except forehead and throat which are steely iridescent blue, and a tuft of pale-yellow feathers at the side of the breast. Female, olive above, wings and tail dusky edged with olive yellow, throat smoky, belly clearer gray, flanks and under tail-coverts yellowish green. Gambia to Angola and the Lakes.

Of these handsome though dull-colored sunbirds we saw occasional individuals about beds of flowering shrubs on the edges of clearings. A male from Lenga Town, August 20, and another from Banga, October 24, had the testes enlarged (5 mm.) and may have been breeding. Büttikofer records a few from Schieffelinsville and Robertport, and Oberholser had it from Mount Coffee.

Anthreptes idius Oberholser

Anthreptes idius Oberholser, Proc. U. S. Nat. Mus., vol. 22, p. 33, 1899: Mount Coffee, Liberia.

Length 5 inches; above dark green, wings fuscous edged with olive green, eye-ring olive yellow; below deep olive yellow, almost uniform but paler on chin; lining of wing olive yellow; bill dark horn, paler beneath.

Nothing further seems to be known of this species than the original statement of Oberholser that it is not uncommon in the bush about Mount Coffee. The possibility is not excluded that it is the immature plumage of some other species.

Anthreptes collaris hypodilus (Jardine and Fraser). Violet-throated Sunbird

Nectarinia hypodilus Jardine and Fraser, Contrib. Orn., p. 153, 1851: Fernando Po.

Small, 4 inches; back green with blue reflections, wings and tail blackish brown, the feathers of the former edged with olive, those of the latter with a green or blue sheen; throat green with a narrow purplish band dividing the green of the throat from the bright yellow of the belly. Female similar but chin and throat pale yellow. Senegal to Angola.

This is a West African race of a widespread species, and is not uncommon in low growth along the edges of clearings.

Anthreptes rectirostris (Shaw). Orange-banded Sunbird

Certhia rectirostris Shaw, Gen. Zool., vol. 8, pt. 6, p. 246, 1811: locality unknown.

Small, 4 inches; male steely green above with blue reflections, becoming olive green on rump; wings and tail blackish, narrowly edged with olive green; throat pale yellow, passing into a shining green band on breast, succeeded by a narrow band of orange; a yellow tuft on each side of breast; belly gray becoming yellow posteriorly and on under tail-coverts. Female, olive green above, throat yellowish white becoming clearer yellow on belly. Senegambia to Gold Coast.

Büttikofer found this a not uncommon species, and secured specimens at Schieffelinsville, Hill Town, Paynesville, and Robertport. He points out that the immature birds in yellowish plumage may be distinguished from immature *hypodilus* by the smaller, more lanceolate first primary. We found a pair nesting at Peahtah, on October 16, the nest placed high in a tangled vine hanging from some trees in an open spot. Again, on the 31st of the same month, we found a female in a finished nest that as yet had no eggs. It was six feet from the ground in a kola tree in the deserted village of Bomboma. The globular nest was made of many small bits of stems more or less held together by webs and prettily lined with soft white vegetable silk. The outside was hung with bits of spider web in which faded kola blossoms were entangled.

Anthreptes tephrolaema (Jardine and Fraser)

Nectarinia tephrolaemus Jardine and Fraser, Contrib. Orn., 1851, p. 154: Fernando Po.

Like *A. rectirostris* but throat paler gray, the golden-green breast-band broader, belly and under tail-coverts pale grayish yellow. Liberia to Angola.

The only record is that of a specimen taken by W. P. Lowe at Settra Kru on the south coast (Bannerman, 1912, p. 234), January 14, 1911. Its known range is thus extended from Angola to Liberia.

Anthreptes gabonica (Hartlaub)

Nectarinia gabonica Hartlaub, Journ. f. Orn., vol. 9, pp. 13, 109, 1861: Gaboon.

Length 4.5 inches; above grayish brown; shoulders and upper tail-coverts often with greenish wash; a narrow forehead and eyebrow stripe, and another below the eye; below white, breast washed with brownish; tail grayish brown, edged with greenish exteriorly and white on inner side; all but middle pair of feathers white-tipped: Gambia to the Congo.

To this species Büttikofer (1889, p. 118–119) finally refers the gray females previously recorded by him (1885, p. 170) as *Cinnyris venustus* and (1888, p. 212) *Anthreptes tephrolaema*. It is apparently confined to the vicinity of streams, for he found its nests of pouch-like form, hanging from twigs or dead limbs about three feet above the water.

Hylia prasina (Cassin). White-eyebrowed Warbler

Sylvia prasina Cassin, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 325, 1855: Moonda River, West Africa.

A small warbler-like bird, dull olive with the top of the head browner than back; a prominent whitish-buff line through the eye, and a darker blackish to olive-brown one below it; chin whitish, rest of under parts olive gray. Portuguese Guinea to Congo.

This greenish warbler with prominent eyestripe, is recorded from the coast region by Büttikofer (Schieffelinsville, Mt. Olive, Paynesville) and by Bannerman (Nana Kru), and we found it rather common in the interior as at Banga, Gbanga, Bomboma, Kolobanu. It frequents tree growth in open places and the edges of clearings, or may be found in thickets close to the ground on the borders of swamps. Although several times we saw pairs together in October, usually there were single birds at this season. Its usual call-note is a clear insect-like *tzee-hee* repeated from time to time as the bird busily gleans among the leaves. It is in the main a species of the lower growth.

ZOSTEROPIDAE White-eyed Warblers

Zosterops senegalensis senegalensis Bonaparte

Zosterops senegalensis Bonaparte, Conspec. Avium, vol. 1, p. 399, 1850: Senegal.

Size of a small warbler, 4 inches; above olive green, front, chin, throat, and under tail-coverts sulphur yellow; a black line from bill below eye; eye-ring white; belly and sides gray tinged with yellow.

This warbler was named by Büttikofer *Z. demeryi* for his collector in Liberia, Demery, based on a male from Robertport, and he also described a second species, *Z. obsoleta*, but both are regarded by Reichenow as synonyms of *Z. senegalensis*. We did not meet with the genus and it is doubtless rare in the republic, though in the drier, more open country to the northeast, Kemp (1905) found it very common about Bo in southeastern Sierra Leone.

SYLVIIDAE Old World Warblers

Sylvia borin (Boddaert). Garden Warbler

Motacilla borin Boddaert, Tabl. Pl. Enlum., p. 35, 1783: France.

Size of a small warbler, 5.5 inches; olive brown above, lores and line through eye dull whitish; below buffy whitish. Europe, wintering in Africa.

This is the species usually called *S. hortensis*, a name now believed to refer to the Orphean Warbler. It is a winter visitor to Africa but apparently not very common in Liberia, perhaps only passing through to the southern parts of the continent. Büttikofer's note of four taken in November near Robertport, still stands as the only record, but on the coast of Sierra Leone, two males were collected by Lowe on the 7th and 9th of March respectively (Bannerman, 1912), perhaps on their return migration.

Phylloscopus trochilus trochilus (Linné). Willow Warbler

Motacilla trochilus Linné, Syst. Nat., ed. 10, vol. 1, p. 188, 1758: England.

A small olive-green warbler varying to olive brown above with a touch of yellowish green on the rump; stripe from nostril over and behind the eye yellowish; lores black; chin, throat, breast and belly whitish more or less streaked with lemon yellow; under tail-coverts pale yellow.

Like the preceding, a European species, wintering in Africa, this warbler seems to be uncommon in Liberia, perhaps avoiding the forested areas. The only record is of a specimen taken at Monrovia by Stampfli (Büttikofer, 1886, p. 252). Kemp (1905) has recorded it from the interior of Sierra Leone at Bo, in February.

Acrocephalus arundinaceus (Linné). Reed Warbler

Turdus arundinaceus Linné, Syst. Nat., ed. 10, vol. 1, p. 170, 1758: Sweden.

Size of a song sparrow, 7.5 inches; above grayish brown washed with rusty yellow, lores dark, eyebrow stripe white or buffy; below white, belly and under tail-coverts washed with rusty yellow; wings and tail dark brown edged with pale brownish.

Breeding in middle and southern Europe, and wintering in Africa south to Natal, this is apparently a rare species in the forested country of western Africa. The only record is that of Büttikofer (1885, p. 172) who mentions a bird that wintered at Robertport, near Cape Mount. It was first seen November 26, and daily sang from among some long reeds in stony ground. Its sprightly song and its attachment for this one locality so impressed this naturalist that he could not bring himself to kill the bird. Finally, however, a few days before New Year's, he decided to collect it, but found the bird had left. No others were seen.

Prinia mistacea melanorhyncha (Jardine and Fraser). Grass Warbler

Drymoeca melanorhynchus Jardine and Fraser, Contrib. Orn., 1852, p. 60: Abomey, Dahomey.

Like a small *Cisticola* (4.5 inches long), but tail more graduated, the outermost feather about the tarsus-length shorter than the longest; above olive brown, a short yellowish or whitish eyebrow stripe; chin white, belly, flanks, and tibiae washed with ochraceous buff; bill black, iris yellow-brown. Africa south to Orange River.

Clearing and cultivation with the destruction of forest and the succeeding growth of shrubs and thickets have no doubt been favorable for the increase and spread of this little warbler in Liberia. It is especially characteristic of the weedy tangles along the borders of rice-fields or in abandoned clearings and even the backyards of the larger towns. Its simple song, consisting of a repetition of three to five loud *quits,* is frequently given, especially in the early hours of the day. On the Du River, where heavy forest had lately been cleared and bushy growth was springing up on the edge of the Firestone rubber plantation, these little birds had already moved in. Büttikofer mentions finding nests at Robertport, October 26, fastened to leaves by sewing.

Cisticola lateralis (Fraser). Sooty-backed Grass Warbler

Drymoica lateralis Fraser, Proc. Zool. Soc. London, 1843, p. 16: Cape Palmas.

A large warbler, 5.5 inches long; dark olive brown above; chin, and center of throat, breast, and belly whitish, sides of breast and the flanks olive gray; tibiae and outer edge of wings rusty; tail-feathers with a subterminal blackish spot. Immature with a wash of yellowish on chin and breast, and lower mandible pale. Portuguese Guinea to Angola.

A characteristic bird of open areas, and clearings with enough large dead bushes and trees remaining to serve as perches; this warbler is another species that is undoubtedly favored by cultivation and agriculture. It is quick to follow in after the virgin forest is cut away, and its hurried cherry warble resounds at any hour of the day from the top of some tall stump remaining or from the topmost twigs of a dead bush or tree at the edge of a cultivated field or in the midst of it. A few also frequent the edges of the seashore and sing from similar perches. In addition to its song, it frequently gives a plaintive plover-like whistle of three notes. Specimens were secured on the Du River, at Gbanga and Paiata.

Cisticola brachyptera brachyptera (Sharpe). Short-winged Grass Warbler

Drymoeca brachyptera Sharpe, Ibis, ser. 2, vol. 6, p. 476, pl. 14, 1870: Fanti, Volta River.

A small, short-tailed species, 4.5 inches; first primary less than half as long as the second; above dull uniform brown; a white mark before the eye; tail-feathers each with a blackish subterminal spot; chin, throat, and midventral area silky white; flanks and tibiae washed with buffy. Gambia to Angola.

This is the *C. rufa* of Chubb and Bannerman. It is much less common than *Prinia* which it at first sight somewhat resembles. In addition to the records of Büttikofer from Paynesville and Robertport, and that of Bannerman from Nana Kru, Whitman and I secured it at Gbanga, in the thick weedy growth at the edges of a rice-field.

Melocichla mentalis mentalis (Fraser)

Drymoica mentalis Fraser, Proc. Zool. Soc. London, 1843, p. 16: Gold Coast, Accra.

Length 8 inches, tail graduated; above brown, becoming rusty on rump; a whitish eyebrow stripe; cheeks and throat whitish to buffy; a narrow black line on each side of throat; below rusty; tail dark brown, outer feathers tipped with paler brown. Liberia to Angola.

At Gbanga, in eastern Liberia I shot a bird of this species on September 16, that flew from a large clearing grown up in part to rank weeds and in part to rice. It alighted among the thick trees and vines along a bordering stream. This is apparently the first record for Liberia, but it is a commoner bird at no very great distance away in the more open country of southeastern Sierra Leone (Kemp, 1905) or in the grassy areas about Freetown in the same country (Thompson, 1925). We did not see it elsewhere.

Camaroptera griseoviridis tincta (Cassin). Gray-throated Warbler

Syncopta tincta Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1855, p. 325: Moonda River, West Africa.

Size of a warbler, 4.5 inches; head, throat, sides, and back light slate gray; scapulars and wing-coverts olive yellow, wing and tail-feathers dark brown, edged with olive yellow; belly white, tibiae ocher yellow. West Africa with other races in East Africa.

Readily distinguished by its greenish coloration and the yellow spot at the ends of the tibiae, this is one of the common small species of thick undergrowth in forests or along their borders, but is not easy to see or collect on account of the difficulty of finding it in such places. *C. brevicaudata* of Büttikofer's lists and *C. chrysocnemis* of Bannerman are the same species. A young male taken at Moala, November 2, differs from the adult in being dark olive green above and washed with yellow below. Its tongue is yellow with two oval black spots at the beginning of the basal third, touching medially. The specimens secured do not seem different from Cameroons birds to which the name *tincta* is currently applied.

Camaroptera concolor Hartlaub. Olive-green Warbler

Camaroptera concolor Hartlaub, Syst. Orn. West Afr., p. 62, 1857: Guinea.

Size of the preceding but entire plumage olive green, the lower side slightly paler and yellower; wings and tail olive brown edged with greenish olive; a yellow mark at the edge of the wrist; bill horn color, the lower mandible paler. West Africa.

Like *C. g. tincta* this is a thicket-loving warbler, found in dense bushy growth along the forest paths or in the under story of second growth. We were unable to detect any difference in the habits of the two. A female taken at Paiata, October 13, was about to lay eggs. Büttikofer records it from Mt. Olive, Paynesville, and Robertport, and we secured specimens at Gbanga, Paiata, and Banga.

Camaroptera flavigularis Reichenow. Yellow-throated Warbler

Camaroptera flavigularis Reichenow, Orn. Monatsb., 1894, p. 126: Cameroons, Yaunde.

Length 4 inches; above olive green, wings and tail dusky brown, edged with olive green; a narrow eyebrow-stripe, the cheeks, throat, under tail-coverts, and a spot near the bend of the wing bright yellow; belly white, ends of tibiae yellowish olive. Cameroon region.

A single immature female taken at Paiata, October 6, seems to represent this species, and would thus extend its known range into Liberia.

Stiphrornis erythrothorax Hartlaub. Orange-throated Warbler

Stiphrornis erythrothorax Hartlaub, Journ. f. Orn., vol. 3, pp. 355, 360, 1855: Gold Coast, Dabocrom.

A short-tailed warbler-like bird; olive brown above with a small white mark in front of the eye, dark slaty-gray cheeks, orange throat, belly and under tail-coverts pale yellowish, sides washed with olive gray. Liberia to Togo.

Büttikofer (1888, p. 74) obtained this species on the Junk and Du rivers in thick brushwood and undergrowth of low forest. He describes its song as soft and agreeable. Dr. Linder procured a male at Totokwelli, October 28, in a thicket beside a forest path. It was singing softly as it hopped about in the dense cover very near the ground. It is apparently an uncommon species.

Sylvietta stampflii Büttikofer. Short-tailed Warbler

Sylvietta stampflii Büttikofer, Notes Leyden Mus., vol. 8, p. 252, 1886: Monrovia, Liberia.

Length about 3 inches, tail very short; crown brownish gray, body olive green, wings darker; eyebrow stripe and cheeks yellowish brown; throat, breast and belly white, sides brownish gray. Liberia.

Büttikofer described this short-tailed warbler from a single specimen collected in the graveyard at Monrovia, November 26, by Stampfli. It is said to resemble *S. flaviventris* but has the belly white and flanks ashy. I saw a single bird of what was apparently the same species at Paiata, at close range among a low thicket of dense bushes and thorny vines on the edge of a swamp. Its movements were those of a warbler and its short tail gave the impression of a sunbird. It is evidently uncommon.

Eremomela badiceps (Fraser)

Sylvia badiceps Fraser, Proc. Zool. Soc. London, p. 144, 1842: Fernando Po.

Length four inches; crown chestnut brown, lores black, sides of head and neck, and the entire back gray; wing and tail blackish brown, throat buffy; a black throat-band; belly pale gray washed with buffy. Liberia to the Congo and Lakes.

The only ground for including this species is the old record by Hartlaub of a specimen in the Bremen Museum from Liberia.

CERTHIIDAE Tree Creepers

Amaurocichla kempi Sharpe. Brown Bush-creeper

Amaurocichla kempi Sharpe, Bull. Brit. Orn. Club, vol. 15, p. 38, 1905: Bo, Sierra Leone.

Size of a small sparrow, with very short tail, long neck, and bill as long as head. Above, uniform dark olive brown; throat and center of belly dull whitish, flanks olive washed with dull rufous; iris yellow.

A colored plate of this bird accompanies the paper by Kemp (1905) in the Ibis, on birds of Sierra Leone. The genus had previously been known from a single species, *A. bocagei*, from the island of São Thomé from which the Sierra Leone bird is not greatly different. The specimen which we secured at Bakratown is the first known locality outside of the original station. It was a female found hopping about, warbler-like, among the low bushes and tangled vines of a hillside thicket close to our compound, October 1. Its length of neck, in so small a bird proportionally long, as well as its long bill and short tail are striking characteristics. Its stomach contained remains of insects.

LANIIDAE Shrikes

Sigmodus caniceps Bonaparte. Gray-crowned Bush Shrike; "Baboon-bird"

Sigmodus caniceps Bonaparte, Conspec. Avium, vol. 1, p. 365, 1850: Niger.

Length 8 inches; crown grayish white, throat and rest of upper surface steely black, the primaries with a white bar near base of inner vane; abdomen and under tail-coverts pale rusty; bill, naked ring around eye, and feet red, iris yellow. Young birds have the crown blackish, the forehead only is grayish, and the throat rusty; bill largely blackish. Sierra Leone to Togo.

This is a bird of thick cover, which we only twice met with, once on the Du and again near Tappi Town where Whitman secured an immature male on October 2. It frequents dense bushy growth near streams, and in spite of its striking coloration is not often seen. Büttikofer notes several from Old Field on the Junk, and at Hill Town and Schieffelinsville, while Oberholser records one from Mount Coffee.

Tschagra australis ussheri (Sharpe). Ussher's Red-winged Shrike

Laniarius ussheri Sharpe, in Layard's Birds of So. Africa, p. 397, 1882: Gold Coast.

Smaller, length 7.5 inches; crown and entire back olive brown; a narrow black eye-stripe, a white superciliary stripe, bordered above by a second black stripe; wings dark brown, the edges of the feathers and most of the wing-coverts chestnut; chin and middle of breast white, the sides washed with gray; tail black, graduated, each feather broadly tipped with white. Gold Coast to Liberia.

We secured four specimens at Gbanga in September, including one young bird, on the 15th, which seem to be the first recorded for Liberia. It was uncommon but we saw a few at Gbanga in bushy tangles along the edges of clearings by streams. Always they were shy and watchful, keeping near the ground or among fallen branches into which they retreated at once when approached. The immature bird has the eye-stripe buffy. It may be that Büttikofer at times confused this species with the following which he records from Cape Mount, but Kemp (1905) found it much the rarer of the two in southeastern Sierra Leone. Thompson (1925) notes its habit of scratching among fallen leaves.

Tschagra senegala senegala (Linné). Senegal Red-winged Shrike

Lanius senegalus Linné, Syst. Nat., ed. 12, vol. 1, pt. 1, p. 137, 1766: Senegal.

Length 9 inches; crown black, a white superciliary line becoming ocher yellow behind; a black line through the eye; neck and back yellowish brown to rusty, rump gray, wing-coverts rusty, the inner ones blackish brown with rusty edges, wing-feathers the same; throat and middle of belly white, sides gray; middle tail-feathers gray-brown barred with dusky, the others black with white tips, the outermost with white edges. Africa south of the Sahara.

Büttikofer found this shrike at the estuary of Grand Cape Mount, in the small "bosquets" and so-called wild peach trees (*Anona*) with which the grassy plains are interspersed. We did not meet with it.

Nicator chloris chloris (Lesson). Yellow-spotted Bush Shrike

Tschagra chloris Lesson, Traité d'Orn., 1831, p. 373: Africa, Galam.

Size of a thrush, 9 inches; above olive green, wings blackish edged with olive green; inner wing-feathers and larger coverts with a terminal light-yellow spot; eye-ring and cheeks yellow-green; a white spot before the eye; chin white, breast gray, paling on the sides; under tail-coverts yellow. Senegal to the Lakes.

A generally distributed species in the under story of high forest, but apparently nowhere common.

Chlorophoneus zosterops (Büttikofer)

Laniarius zosterops Büttikofer, Notes Leyden Mus., vol. 11, p. 98, 1889: Du River.

Crown, neck, and upper back gray, ear region darker; a black band from forehead to eye and ear region; eyelids grayish white; back olive green; breast orange, belly yellow; tail with yellow tips to feathers.

This shrike is known from Büttikofer's description only, based on an adult female from the Du River.

Chlorophoneus melamprosopus (Reichenow)

Laniarius melamprosopus Reichenow, Journ. f. Orn., vol. 26, p. 209, 1878: Liberia.

Length 9 inches; above gray; a broad band on forehead and sides of head through eye black, bordered above with white; lower back, rump, and inner wing-feathers olive green, primaries blackish brown, green-edged; below yellow; tail-feathers olive green at base with a black mark before the yellow tips.

The old record of a bird collected by Schweitzer in Liberia and described by Reichenow still remains the only one for the country.

Chlorophoneus multicolor (G. R. Gray)

Laniarius multicolor G. R. Gray, Genera Birds, vol. 1, p. 299, pl. 72, 1845: "Africa."

Length 8 inches; a broad black band from forehead to side of head; forehead behind this band and superciliary line white; occiput and neck gray, rest of back, the wing-coverts and inner wing-feathers olive green; primaries dark brown, edged with olive green; below, scarlet becoming orange on belly and under tail-coverts; tail olive green with black just before the orange or yellow tips. Gambia to Togo.

A handsome species but apparently rare. Büttikofer secured one near the Junk River, a second near the Farmington River, and a third at Mt. Olive. Oberholser has recorded a male from Mount Coffee.

Laniarius leucorhynchus (Hartlaub)

Telephonus leucorhynchus Hartlaub, Rev. Zool., 1848, p. 108: Elmina, Gold Coast.

Size 9.25 inches; entirely black, or by reflected light, brownish; eye red-brown, bill black or in old birds white with a reddish tint; feet blue-gray. Sierra Leone to Congo.

The two Liberian records for this species are by Büttikofer: one taken by Stampfli at Schieffelinsville and another at Robertport. Nothing further is known of its occurrence here. At the latter locality, Büttikofer (1885, p. 183, as *Melaenornis edolioides*) found a nesting pair in a swamp directly behind the beach. The flimsy nest containing two eggs was in a low bush.

Dryoscopus gambensis gambensis (Lichtenstein). Gambian Puff-backed Shrike

Lanius gambensis Lichtenstein, Verzeich. Doubl., 1823, p. 48: Senegambia.

Length 7.5 inches; crown, neck, upper tail-coverts and tail black; a brownish-gray shoulder stripe; lower back and rump whitish gray; wings dark brown, edged with grayish white; below white. Senegambia to Angola.

Although said to be plentiful around Freetown in southern Sierra Leone, this shrike is rare in Liberia. Büttikofer found it near Monrovia and at Paynesville and Stampfli collected three at Old Field and Schieffelinsville, while Lowe took it at Settra Kru on the south coast. It is a bird of thickets.

Malaconotus poliochlamys Gadow. Orange-throated Bush Shrike

Laniarius poliochlamys Gadow, Cat. Birds Brit. Mus., vol. 8, p. 155, pl. 3, 1883: Gold Coast, Fanti.

A large shrike, 10 inches long, with heavy bill; base of bill and the eye-ring white; head blue-gray; lower back, wing-coverts (except anteriormost which are black), outer edges of wing-feathers, olive green; secondaries with subterminal black area and yellow tips; tail-feathers olive green with subterminal black bar and yellow tips; throat and breast orange red, paling to yellow on belly and under tail-coverts. Iris gray. Sierra Leone to Togo.

This is doubtless the same as *Laniarius cruentus* of Chubb's list obviously based on Büttikofer's record of a bird from the Sulima River across the border in Sierra Leone. Kemp (1905) has recorded it from Bo in the southeastern part of the same country, but the capture of an adult female at Gbanga, September 25, 1926, seems to be the first actual record for Liberia. It was shot in a tangle of vines among low trees by a small river, and was the only individual seen.

Lanius collaris smithii (Fraser). Black and White Shrike

Collurio smithii Fraser, Proc. Zool. Soc. London, 1843, p. 16: Cape Coast.

A small, slender shrike, 8 inches long; above, shining black with white shoulder-patches and a white spot at base of primaries; tail strongly graduated, the outer feathers with white tips; under parts pure white. West Coast to Congo.

This is the common and conspicuous black and white shrike that is almost invariably found, one pair or rarely two, about the edges of village clearings, perching familiarly on the fences, roof poles, or low trees on the outskirts of the clusters of huts or along the clearings. We saw it all the way across Liberia, but always as a hanger-on of man, haunting the vicinity of his villages. At Gbanga a fledgling in juvenal plumage was taken, September 11, that was dull reddish brown above, whitish below, and everywhere barred with blackish. It is curious that Büttikofer does not include but a single record of this species, namely, one taken at Robertport by his collector. Possibly it has increased locally in the last fifty years. Although probably this is chiefly an insectivorous species, I once saw one chase a small bird.

MOTACILLIDAE. Wagtails

Motacilla aguimp Dumont. African Pied Wagtail

Motacilla aguimp Dumont, Dict. des Sci. Nat., vol. 21, p. 226, 1821: Orange River, Namaqualand.

Slender, length 7.5 inches; blackish gray above; eye-stripe, throat, breast, middle wing-coverts, edges of secondaries, and the two outer tail-feathers white; ear patch, a band across the breast, the rest of the wings and tail black. Africa generally, south of the Sahara.

It has been shown that Dumont's name replaces the familiar *M. vidua* for this bird. The species is another example of a bird with restricted habitat, for it is usually found in pairs along the bare rocks and sand banks of large streams, and by the sides of rapids and falls. We saw it on the St. Paul's River at Paiata, where a pair frequented the small projecting rocky ledges in the stream. One specimen was shot at a distance of a mile or two from the river on a fallen tree-trunk in a clearing, an occurrence unusual not only because of the distance from any stream but also for there being but a single bird (a male), instead of a pair. Both Büttikofer and Oberholser have recorded the species from its usual haunts along the rivers, as the St. Paul's, the Du, St. John's, Cess, and Sino, as well as two from the Farmington River.

Motacilla longicauda Rüppell

Motacilla longicauda Rüppell, Neue Wirbelth. Abyssinien gehör., Birds, p. 84, pl. 29, 1835: Abyssinia, Simen.

Length 7 inches, gray above, darker on head; a white eyebrow stripe; lores black; below white with a black breast-band; wing-coverts black tinged with gray, wings black, the outer feathers with long white marks on inner edges, the inner wing-feathers white at inner base, with broad white outer edges; four middle tail-feathers black, the four outer pairs white. Africa, especially the east and south parts.

Büttikofer supplies the only record, which at the time was the first for western Africa, of a bird taken at the falls of the Du, where it was in company with the preceding species. Its habits are similar for it is said to delight in the mountain streams, feeding close along the edges of the water.

Budytes flavus flavus (Linné). Yellow Wagtail

Motacilla flava Linné, Syst. Nat., ed. 10, vol. 1, p. 185, 1758: "Europe" (= Sweden).

Slender, length 6.5 inches; above olive brown, greener and yellower on lower back; wings blackish brown, the feathers edged with buff or whitish; tail black except the two outer feathers on each side which are mostly white; a buffy eye-stripe; throat whitish, breast, belly and under tail-coverts bright yellow. Breeds in Europe; winters in Africa.

This familiar European bird is a winter resident in Africa, and is not at all uncommon in Liberia, frequenting open banks of streams or coming familiarly about the village outskirts in open cleared ground. Büttikofer mentions it as "not rare" about Grand Cape Mount, and Stampfli took two on the Junk River in December, while Lowe found it in January on the southern coast at Subono and Nana Kru. In Sierra Leone it arrives as early as late September from the north, coming at the close of the rains and staying till early April. No doubt the same is true of it in Liberia. We saw the first one at Paiata on October 5, a female, walking tamely about on the open gravel behind some native huts. Another was taken October 24, a male, at Banga, one of two, walking around the feet of a bullock grazing outside the village. The migration evidently extends into early November, for going north by steamer from Monrovia about November 12, one or two came aboard the ship and were carried back on their course for two days before leaving the vessel.

Anthus gouldi gouldi Fraser. Gould's Pipit

Anthus gouldii Fraser, Proc. Zool. Soc. London, 1843, p. 27: Cape Palmas.

Length 7.5 inches; blackish brown above, greater wing-coverts edged with rusty; an indistinct eye-stripe; throat white, breast and under parts washed with cinnamon; a band of large dusky triangular spots across the breast; outer tail-feathers with pale edges. West Africa.

This is the *Anthus pyrrhonotus* of Büttikofer and Chubb. It is generally distributed wherever there are cleared open spaces, as along the more travelled roadways or on open plains. It is quick to come in to newly cleared ground, as at the Firestone plantation on the Du, where a number were daily seen feeding on the bare ground, which but a few months before was virgin forest, now felled and burned, leaving only charred stumps and uncovered soil. Büttikofer notes that it is found in pairs on "farms" and grassy plains soon after the grass is burned as at Buluma and Cape Mount. Lowe has collected it on the southern coast in January.

In the adjoining country of Sierra Leone it is common in similar situations and Kemp (1905) has also found *A. trivialis* in February in that country.

Macronyx croceus croceus Vieillot. Yellow-throated Long-toe

Alauda crocea Vieillot, Nouv. Dict. d'Hist. Nat., vol. 1, p. 365, 1816: "Java."

Slender, 8 inches long; above blackish brown, the feathers edged with olive brown; a black crescent across the breast; eyebrow stripe, throat, lower breast, belly, under tail-coverts, and tibiae bright yellow; tips of outer tail-feathers white; hind toe very long with an even longer claw. Senegambia to Angola.

The color pattern of this bird is singularly like that of a Meadowlark, and the two are further alike in the general nature of their habitat for the long-toe inhabits the occasional grassy plains interspersed with clumps of low bushes that occur locally along the coastal districts, especially near the northwest border as along the Cape Mount and Marfa Rivers and in the country near the mouth of the Mesurado River. At these places Büttikofer found it, and Stampfli collected three near Paynesville. Whitman of our party also secured a single bird near Monrovia but elsewhere we did not meet with it, and it is evidently of very local occurrence, limited to places where the conditions it requires are present. To the northward of the heavily forested areas, as in parts of Sierra Leone, it seems to be commoner.

PLOCEIDAE Weaver-birds

Plesiositagra cucullatus cucullatus (S. Müller). Black-headed or Palm Weaver

Oriolus cucullatus S. Müller, Linn. Natursys., Suppl., p. 87, 1776: Senegal.

Size of a starling, 6.5 inches; male with head black, edged by a chestnut collar; back and wings yellow and black, tail olive, breast brownish passing into clear yellow on belly and under tail-coverts. Female olive on head, back and tail, throat yellow, belly whitish. Iris red. Senegambia to Gaboon.

Of the wonderfully diverse family of weavers, this is the most common and conspicuous of Liberian species, highly social in habits, and dwelling in large colonies, generally in close proximity to some center of human activity. Büttikofer notes their fondness for building in a large tree where a pair of *Gypohierax* has an eyrie, while Kemp speaks of their colonies in some busy center, as the proximity of a railroad station, in Sierra Leone. No doubt this preference for the vicinity of human settlements is of more than chance significance, and is a common trait in this group, as shown in *Spermestes* or even in the House Sparrow, now regarded as a Ploceid. It is surely not for protection nor is it because of the cleared areas about towns, but probably is only a further expression of the social nature of the species. Although Büttikofer speaks of occasionally finding colonies far from human habitations, even in forests, we did not find any such. Almost every village the length and breadth of the land has a colony of varying size usually either in the fronds of a tall oil palm towering over the thatched huts, or in the outer branches of a great silk-cotton tree, of which one or two frequently remain of the original forest cover, to stand conspicuously like guardians over the chief's compound. Again they will start colonies among smaller trees. Thus at Moylakwelli, in the midst of the village clearing was a small fig tree only twenty to twenty-five feet high with a considerable colony of these birds, which we were specially asked not to molest, for when the town was founded two or three years previously, the birds had at once taken up residence in the tree, and this was looked upon by the natives as a good omen. They feared that should the birds desert the situation the good fortune of the village would also leave. This was the only instance in which we found any concern displayed by the inhabitants for the welfare of birds. It is interesting that this bird of the outer branches of trees has a livery similar in tones to that of the orioles of our own country, and like them builds a pendant purse-like nest. Occasionally, as Büttikofer has recorded, a colony of some other weaver will occupy the same tree with the Black-headed Weaver. He found such a nesting colony of this species and *M. castaneofusca* at Robertport. It is evident, however, that the Black-headed is the dominant species in such cases.

The life-history of this eminently gregarious bird merits a fuller investigation than we were able to make, for its highly social nature makes it of more than usual interest. The most active season of nesting seems to come toward the close of the rains, for the torrential downpours of the wet period must eventually soak through even the snugly roofed-over baskets of the weavers. We found young just able to fly in a large colony at Suehn, November 4. While the birds of the colony appear to remain more or less in the vicinity of their home-tree most of the year, Kemp (1905) says that they occasionally may leave for several days together, flying off in parties of twenty to fifty. At such times they visit the neighboring rice fields and undoubtedly devour a considerable amount of grain. During the ripening period the women and boys spend much of the day posted on lookouts here and there in the fields to drive away the marauding flocks with shouts, sticks, and stones. The flocks of birds that we found in August and early October consisted of both old and young birds of both sexes. In July the colonies are not wholly deserted but more or less activity continues about the old nests, which are added to frequently.

In so gregarious a species, it is interesting to see how well developed the sense of "territory" is, for one would think that the individual bird could hardly guard its own nest from invasion by its neighbors. But apparently as a preliminary to breeding the males of the various pairs take up a definite station and preëmpt a small "territory" consisting of a separate small branch which supports the nest. At Suahkoko, on September 1, I watched for some time a small and apparently newly started colony in a young silk-cotton tree by the side of the chief's stockade. There were perhaps three dozen birds. In the early morning till about ten o'clock the males were much in evidence about this tree. Each seemed to have preëmpted a special small branch and drove off with threatening advance, any others of the colony that chanced to alight upon it, presently returning to settle down momentarily. Some of these branches had a single nest of the previous season, made of strips of palm leaf now faded and brown, but others were evidently newly made claims on which nest-building had not yet begun. Where there was an old nest on the branch, the incumbent male seemed to take great interest in it. One I watched brought long strands of palm leaf and, clinging to the under side of the structure, would weave them in and out, poking the end in and pulling it through with its bill, and poking it in again. This particular male was first seen clinging to the under side of the old nest, and looking into it, meanwhile fluttering his widely open wings above his back like a huge butterfly. Presently to my surprise a small bird of an unrecognized species flew out and away, and though I afterward saw the old male weaving additional strands into the substance of the nest, I did not again see him looking in and fluttering his wings, a frequent action observed at various colonies and perhaps in the nature of a courtship display. Some of the other males stationed each on his proper branch, would occasionally pluck off a piece of a nearby leaf, toying with it in their bills. Some that had no nest on their branch would come with a fresh strip of palm leaf and start weaving it among the twigs. Büttikofer says that the ring-like opening of the nest is first constructed and the purse-like portion afterward. It is certain, however, that the old nests are frequently added to in the succeeding season, for several of those in this little colony showed new green strips interwoven with the faded brown ones of the previous nesting period. In the two or three days while this colony was watched no females were in evidence in the nesting tree though I once saw a single one some 150 yards away. At the large colony at Suehn, in early November, several hundred birds were actively engaged and quantities of nests swung from the branches of a giant silk-cotton tree that shaded the principal dwellings. This colony had evidently been here for a long time. In contrast to the new one just described, with but a single nest to a small branch (usually averaging about a yard in length), the swinging baskets were thickly clustered, especially on some of the larger dead branches. In these clusters some of the nests appeared to be old, and may have been unused at the time. Each was usually on a separate twig, though not on a separate small branch. There was great activity throughout the day, with a continuous uproar of squeaks and chattering and sibilant notes of the birds. The males seemed the most in evidence and were constantly coming and going, some sitting near their nests, others clinging to the under side and peeking into the nest-opening with fluttering wings, like so many butterflies. Many others were arriving with long trailing strips of palm leaf taken from a tree a hundred yards or more away. No sooner would a male bird alight on the nest and start weaving in the strip when two or three of his neighbors, males, would seize the hanging thread, and try to drag it away. At times two or three males would be hanging to the same strip, which eventually broke or was cut by their sharp bills before the first male could weave in more than a very small portion of it. So great is the demand for the strips of palm leaf that often nearly every frond of a tree near a large colony is stripped to the midrib of the leaflets, leaving the tree with a most ragged appearance. The birds secure the strips by biting a small slit at the edge of the leaflet and then, flying away, tear it down toward the end of the frond. In the large tree in which the above-mentioned colony nested there were two or three Kites present at frequent intervals and once or twice a small hawk was seen among the branches, but although these may prey regularly upon such a constant source of food, I did not happen to see them disturb the weavers, nor did the latter pay any attention to the hawks.

Hyphanturgus aurantius (Vieillot). Golden Weaver

Malimbus aurantius Vieillot, Ois. Chant., p. 73, pl. 44, 1805: Congo.

Length 5.5 inches; head and under parts golden to orange yellow, the back golden, the rump clearer; a black line through the eye; wing and tail-feathers dark brown, gold-edged; bill black. Liberia to Congo.

The Golden Weaver has been found at several localities along the coast as at Robertport by Büttikofer, and at Nana Kru and Subono by Lowe. It is apparently rare and local, for we did not meet with it. At Robertport Büttikofer says that the nests were found in small colonies of twelve to thirty in thickets along the seashore, not close together but rather scattered, and at four to eight feet from the ground. On his first visit in 1885, the birds had eggs in November but in December a year later, on again visiting the locality none could be found, indicating the temporary nature of the colonies.

Hyphanturgus ocularius brachypterus (Swainson). Swainson's Spectacled Weaver

Ploceus brachypterus Swainson, Birds West Africa, vol. 1, p. 168, pl. 10, 1837: no locality.

Size of the Hooded Weaver; chin, upper throat, and a line from base of bill through eye, black; top and sides of head yellow washed with chestnut; back and wings olive green, tail darker olive; under side greenish yellow, iris white. Senegambia to Loango.

We found a small colony of this white-eyed weaver at Kaka Town, but did not meet with it elsewhere. Apparently it is not common, and perhaps is less social than the Hooded Weaver. According to Thompson (1925) it nests in small bushes among grass in Sierra Leone, and we attributed to it a few nests in low thorn bushes at Moala although no birds were seen. In the former country it seems to be commoner. Büttikofer found it at Robertport sparingly and records a female from Old Field, Mesurado River. Lowe procured it at Nana Kru.

Melanopteryx nigerrimus (Vieillot). Black Weaver

Ploceus nigerrimus Vieillot, Nouv. Dict. d'Hist. Nat., vol. 34, p. 130, 1819: Congo.

Length 6.5 inches; plumage entirely black, iris golden, feet brown.

The only records for Liberia are those of Büttikofer who mentions it from Jarjee, and also recounts the very interesting circumstance that at Schieffelinsville a colony of about twenty nests was found all hanging close together from the lowest branch of a huge silk-cotton tree near the station. In the crown of the tree was a large colony of Hooded Weavers that constantly attacked these nests and used the material in their own. On visiting the place some weeks later he found that the whole colony had left. Possibly in competition of this sort, the more aggressive Hooded Weavers actually crowd out the species of similar breeding habits, which in part would account for their fewer numbers.

In his list of Liberian birds Chubb includes *Ploceus nigricollis,* but this is a more eastern species and was perhaps intended for the present or the next species. Büttikofer does not include it in his final list.

Melanopteryx albinucha (Bocage). White-naped Weaver

Sycobius albinucha Bocage, Jorn. Sci. Math. Phys. e Nat., Lisboa, vol. 5, p. 247, 1876: Angola.

Length 5.5 inches; entire plumage black, mixed on the nape with white. Sexes alike. Sierra Leone to Niger.

The only previous record for Liberia was that of Büttikofer who found a small colony at Schieffelinsville. Dr. Linder secured a specimen at Banga on October 24, which is passing from immature plumage to that of the adult. It has a certain amount of brown on the wings, crown, and throat, while the belly is brownish gray, and the under tail-coverts buffy. Kemp's recent record (1905) of a breeding colony in the Mission grounds at Bo, Sierra Leone, extends its known range beyond Liberia.

Melanopteryx castaneo-fuscus (Lesson)

Ploceus castaneo-fuscus Lesson, Rev. de Zool., 1840, p. 99: Senegambia, Casamanse.

Length 6 inches; head, neck, breast, wings, and tail black; entire back, abdomen, and under tail-coverts chestnut. Female duller, the feathers more or less edged with olive. Senegal to Congo.

Although Büttikofer found this a common species at Robertport, at Bavia on the St. Paul's River, and on the Mesurado and Junk rivers, the only one we saw was an adult male shot by Whitman at Monrovia. Possibly it is local in its occurrence, for unlike the Hooded and some other weavers, its preference for nesting is in jungles of very high grass, though at times colonies build in trees as well. Büttikofer tells of a flock that in December, 1881, was seen building nests busily all day in a tree. The birds left that night but returning the next day, they abandoned the tree nests and started a number of new nests in a jungle of reeds near by. Lowe collected the species on the south coast at Nana Kru. In the neighboring parts of Sierra Leone, Thompson (1925) and Kemp (1905) both mention their breeding in colonies in the tall elephant-grass, but note that the exact position of the colony may change from year to year. The eggs are laid in early October, and there are apparently two broods in a year. Since this is a bird of more open country, it is probably altogether absent from the Liberian forests but more common toward the northern borders where the country becomes more open.

Melanopteryx fusco-castaneus (Bocage)

Hyphantornis fusco-castanea Bocage, Jorn. Sci. Math. Phys. e Nat. Lisboa, vol. 8, p. 58, 1880: Loango, Rio Loemma.

Length 6 inches; chin, top and sides of head, the back, wings, and tail black; nape with a bright yellow crescent extending between the shoulders; throat, breast, and belly deep chestnut. Sexes alike or nearly so. Sierra Leone to Loango.

This is a rare bird, apparently not at all of a gregarious nature, and doubtless a solitary forest-dweller. Büttikofer mentions but two specimens: one shot from a high tree at Bavia, St. Paul's River, the only one noted on his first trip; the other an adult female at Schieffelinsville, "in brushwood." We saw the bird but once, an adult male on the Du River, August 5.

Malimbus scutatus scutatus (Cassin)

Scobius [sic] *scutatus* Cassin, Proc. Acad. Nat. Sci., Philadelphia, 1849, p. 157: ? Sierra Leone.

Length 6.5 inches; male, top of head, sides of neck behind ear region, upper breast, and under tail-coverts orange red, elsewhere black. Female similar but with only the upper breast orange red. Sierra Leone to Niger.

A forest-dweller like others of this genus, this species is uncommon, usually occurring alone or in pairs in open forest. Büttikofer secured several at his collecting stations, Robertport, Soforé Place, near Buluma, at Mt. Olive and Jarjee, while Stampfli obtained four at Schieffelinsville; Oberholser records two adults from Mount Coffee, and Lowe collected it at Nana Kru on the south coast. We met with but few, one of which was shot by Whitman at Miamu, and a second at Banga, hopping along the midrib of a palm frond at the edge of the forest. The latter bird was picking at something from time to time, doubtless insects with which its stomach was filled.

Malimbus malimbicus melanobrephus Hartert. Scarlet-hooded Forest Weaver

Malimbus malimbicus melanobrephus Hartert, Novit. Zool., vol. 14, p. 491, 1907: Fanti, Gold Coast.

Length 6 inches; head, throat, and upper breast except the chin, a ring about the eyes and a band at base of bill, scarlet; elsewhere shining black. In the male the scarlet feathers are stiffened and longer than in the female. Liberia to Loango.

This, like others of the genus, is an uncommon forest bird. Büttikofer secured several at Schieffelinsville, Bavia, Paynesville (recorded as *M. cristatus*) and Hill Town, while Lowe collected it at Nana Kru. Whitman shot one at Kaka Town and Dr. Linder a second at Banga, October 22. This latter was one of a breeding pair that Linder watched at work on their nest, swung from the end of a long drooping frond of a climbing palm, hanging directly over a small brook in the forest. The nest was in typical position, about fifteen feet from the ground, a globular structure with a projecting roof over the entrance near the top on one side. Although nearly finished, it contained no eggs. The birds were extremely shy and flew away at the least alarm. We found a second similar nest in exactly the same sort of situation not very far away, perhaps an old nest of the same pair.

Malimbus nitens (J. E. Gray). Red-throated Forest Weaver

Ploceus nitens J. E. Gray, Zool. Miscellany, vol. 1, p. 7, 1831: Africa.

Length 6.5 inches; plumage everywhere shining black, shading to smoky brown on belly, except the throat which bears a shield of stiffened scarlet feathers. Female similar but belly somewhat grayish. Bill pale blue-gray; iris red. Portuguese Guinea to Loango.

Like other species of the genus, a bird rarely seen on account of its secretive habits and the difficulty of penetrating the dense cover in which it lives. Büttikofer notes a few specimens from his collecting stations at Bavia, Schieffelinsville, Hill Town, Mt. Gallilee, Robertport, and Jarjee. We saw a few at Paiata, and secured two. One of these, taken by Dr. Linder, October 14, was seen with its mate starting a nest in a low bush overhanging water, globular with the usual entrance at one side. I saw the species several times in the same region, where in low swamps near the St. Paul's River one might occasionally startle a pair or get a brief glimpse of the birds as they showed themselves for a second or two in flying from one leafy tangle of bushes and thorny vines to another. They seemed to be usually in pairs, both birds keeping close together.

Malimbus rubricollis bartletti Sharpe. Red-crowned Black Weaver

Malimbus bartletti Sharpe, Cat. Birds Brit. Mus., vol. 13, p. 479, 1890: Gold Coast.

Length 8 inches; top of head from base of bill to neck and behind the ear region carmine, rest of the plumage including the region from bill to eye and ear, shining black; iris hazel. In the female the forehead to the level of the eyes is black. Liberia to Togo.

Of the black forest weavers, this is perhaps the one most often seen of this secretive genus. It inhabits thickets to some extent but often occurs in more open situations. I occasionally saw single birds working their way about in long, hanging vines, apparently searching for insects, or hopping along the fronds of palm trees in shaded places. Büttikofer even remarks that they may be found in clearings sitting on isolated trees and stumps watching for passing insects, but we saw nothing of the kind, except that once a bird seemed to be securing ants from a large nest on a tree.

Quelea erythrops (Hartlaub)

Ploceus erythrops Hartlaub, Rev. de Zool., p. 109, 1848: Island of St. Thomé.

Length 4.5 inches; head and throat carmine, the latter with dark bases to the feathers; back blackish brown, rump paler; breast and flanks bright brown, belly white; wings dark brown, the feathers with yellow outer and white inner edges. Senegambia to Angola.

Although this little weaver may at times occur in some numbers, we saw it but once, at Paiata, in a thicket at the edge of a rice-field. Büttikofer speaks of securing many immature birds on the Farmington River; and at other stations (Bendo near Fisherman Lake, and at Schieffelinsville) it occurred in "brushwood" and coffee plantations. Lowe obtained it at Subono.

Coliuspasser macroura (Gmelin). Yellow-mantled Black Weaver

Loxia macroura Gmelin, Linné's Syst. Nat., ed. 13, vol. 1, pt. 2, p. 845, 1788: Senegal, Whidah country.

Length 8 inches; male with lesser wing-coverts and back between shoulders bright yellow; rest of the plumage black, the greater wing-coverts edged with brownish white; a small concealed white spot is present in the center of the breast; neck feathers form a short outstanding ruff. Female, streaked brownish yellow. Senegambia to Angola.

In many of its habits this handsome weaver reminds one of a grackle. It comes familiarly about the edges of villages walking with a grackle-like waddle on the bare ground. It is curiously solitary in disposition, the birds one sees being almost always lone males, and though we made some effort to secure a female at Gbanga where it was not uncommon among the extensive rice-fields, we did not see two birds of a pair together at any time. Büttikofer also speaks of it at Robertport, as seen alone or in pairs with the young, and records specimens from the Junk River, Schieffelinsville and Marshall, as well as from the reedy jungles of the Sulymah River. It probably nests in open grassy marshes as our Redwings do; for on September 19 at Gbanga, Whitman and I saw an adult male carry a strip of grass to a nest he had started in a low clump of grass by a brook in an open marsh. After we had examined the few interwoven strands he came back at once, worked upon it briefly, and again flew off. He had a small part of a green basket outlined. Nothing was seen of a female at this time. On the ground this species both walks or makes short hops and when perched will open the wings and tail and shut them with a quick movement. Its usual perch is the summit of some low tree or bush. It seems to be of general distribution in more open situations, but we did not find it common anywhere.

Coliuspasser concolor concolor (Cassin). Long-tailed Black Weaver

Vidua concolor Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1848, p. 66: no locality.

Size of a song sparrow, but with a very long tail in the male, the tail-feathers about twice as long as the length of head and body; entire plumage black, wing-coverts, secondaries, and under tail-coverts narrowly edged with whitish; iris red. Female of normal form, sparrow-like in color, streaked olive buff and black above, throat yellowish with fine streaks, belly whitish. Gambia to Angola and the Lake region.

Apparently there is no previous record of this bird from Liberia, but we found it common in the interior near the eastern border, as at Gbanga, in open cleared country, grown up with rank grass or in the fields of tall rice. Nearer the coast it seems to be absent from the cleared areas though across the border in Sierra Leone, Büttikofer (1892, pp. 14, 28) found it in the "cane jungles" on the Sulymah River, in September, October, and November. At Gbanga, on our arrival in early September, the males were already in breeding plumage, though one shot September 8 had the tail still incompletely grown. On September 14 a large flock was seen there consisting of adult males, adult females, and a number of immature males, the last still in the dull plumage of the female type. They probably do not acquire full black breeding dress with the long tail-feathers until at least the second year. When in ordinary flight the long tail-feathers of the male are held closed together, and apparently have enough stiffness so that they do not wave up and down to impede the bird's progress as they do in the small Black and White Wydah, but the flocks, often of adult males alone or of both sexes, dash swiftly by in very compact order. On September 12, we found a nest of this species, woven among the tops of some tall rice-stalks, a little round ball consisting of grass strips and fibers, about four feet up in the middle of a large field. It contained two eggs heavily speckled with dark on a greenish ground. The female was seen at the nest or near it, and in succeeding days on visiting the nest she would slip out and away when we approached. On the 14th there were three eggs, apparently the full complement. The actions of the male were interesting. When the female was at the nest or near it, he seemed highly interested or excited, continually flitting about over her with all the elongated tail-feathers spread, or alighting on one side of her and then on the other. This display flight is very different from the ordinary flight, the male hovering about, taking short slow flights with fluttering wings, and with the tail depressed and spread out fanwise so that it looks much larger than in ordinary flight. By September 22 many more pairs of the birds were settled in particular areas of rank grass jungle or tall rice and the old males made a curious appearance hovering about each over his chosen site. The males frequently pursue other females or their own mates, with a similar fluttering flight and spread tails. One male that I watched kept guard over a territory perhaps 150 to 200 feet long, often pursuing and chasing off other birds that passed or came into it, including females of the same or other species of weavers, and once a *Pyromelana*. His usual method was to fly in the slow fluttering manner with spread tail at any perching bird which would invariably give way and leave the perch when closely approached, whereupon the aggressive male would himself alight upon the place. These are silent birds and I never heard one make a note, but possibly as with *Pyromelana* the display flight takes the place of song. Not all the birds seemed to be nesting even by September 25, when I saw a flock of seventeen adult males with two in dull plumage fly by in rather open order. After leaving the extensive clearings in the region of Gbanga we saw no more of the species. They are typically seed-eaters and feed much upon the ground in places where the fields are covered with a thin growth of rice or weeds.

Pyromelana hordacea hordacea (Linné). Fire-headed Weaver

Loxia hordacea Linné, Syst. Nat., ed. 10, vol. 1, p. 173, 1758: "Indiis," but probably Senegal.

Size of a Bobolink, 5.5 inches; male with the beak, sides of head, chin, wings, tail and belly deep black; top of head, nape, sides of head, throat, and rump bright orange red; back, under tail-coverts, and tibiae reddish brown. Female, and male in non-breeding dress, dull brown, streaked above, chin and belly whitish washed with buff, breast yellowish with fine streaks. Africa south of the Sahara.

Kemp (1905) says that in Sierra Leone, where on account of the bright colors of the breeding males this is called "Christmas-bird," the males attain their full nuptial plumage in late July and early August. We saw our first colony at Plantation 3 on the Du River, where a number of pairs were commencing to breed in the first week of August in a patch of rank weeds and grass. We saw a number of old nests and a few new ones on August 5, one of the latter with four blue eggs. In practically every case the globular nest was suspended from two stout grass stems and at a height of five feet or less. At Gbanga, in September we found a good many in similar situations. They prefer a mixture of rank weeds and grass to a grass jungle alone. The males are very conspicuous perching about here and there on the tops of the weeds, and like the Long-tailed Black Weavers, their neighbors, they are very silent, making up for the lack of sound by their notable plumage and actions. From their conspicuous perches they often take short flights, with body feathers obviously puffed out, and on hovering wings with slow up and down strokes flutter a short distance to some other perch, showing off their bright coloring to great effect. One on alighting from such a display flight, spread his wings out on each side downward. Other passing birds are pursued and driven away. I saw three chase off a Spurred Coucal (*Centropus*), and on another occasion a Long-tailed Black Weaver (*Coliuspasser*) was driven away by a male whose territory he had invaded. Another time while a male was making one of his slow, fluttering display flights his mate left a nearby perch and flew off over the sea of weed-tops, when the male instantly changed his manner of flying and dashed rapidly after her. In their habit of perching conspicuously about on the grass and weed-tops, and in their modified display type of flight, as well as in the lively pursuit flight of the male after his mate, these weavers recall very strongly the somewhat similar habits of our meadow-living Bobolinks.

Spermestes cucullatus cucullatus Swainson. Hooded Waxbill or Thatch-bird

Spermestes cucullata Swainson, Birds West Africa, vol. 1, p. 201, 1837: no locality.

Small, length 3.75 inches; throat and tail black, crown, shoulder-patches, and a small flank patch black with green sheen; back and wings grayish brown, belly white; flanks, and upper and under tail-coverts barred black and white. Female slightly duller. Senegambia to the Lake region.

In the villages of the interior this is a common household bird, coming familiarly about the natives' huts and usually making its nests in hollows or holes of the thatched roofs. Apparently it is less common on the coast for Lowe did not collect it during his visit to Liberia, and Büttikofer seems to have either confused this with the following species or found it at only a few places. We first noticed it at Kaka Town in late August, and watched several birds actively building nests, even though the rains were still heavy. Apparently the serious work of nest-building fell to the share of the female. We saw one bringing stalks of dead grass two or three times her own length, selecting a kind that had a long stem surmounted by a few lateral branches at the tip. These stalks were carried by the butt end and taken into a hole among the roofing thatch (usually of palm fronds) where the bird would proceed to arrange them. The male would sometimes fly out to meet the incoming female and on her again leaving for more material, he would accompany her a short distance. Once I saw a male fly down to the ground, pick up a bit of loose material, fly with it to the nest-hole, into which he carried it, presently popping out again; but the females seemed to do most of the building. From Kakatown inland, these little mannikins were present about almost every large native village, but were noticeable for their absence from one or two deserted towns, whose tumbledown roofs might nevertheless have been available as nesting sites. Evidently the birds prefer the close association with natives and their domestic life. Fledglings were found at Gbanga in early September, and birds in the first-winter plumage by the 27th of that month. Notwithstanding their strong liking for thatched roofs as building sites, they sometimes revert to their primitive habit of nesting in trees. The only place where we observed this was at Medina, where on October 30, we saw a little colony building nests in a small tree beside a native house in the center of the village. Some of the birds were even taking nesting material from the roof of the adjacent hut. There were at least three nests, placed close together on the branches where several small twigs came off, instead of being pensile, like the nests of so many of this group. These nests were bulky, built of grasses and pieces of thatch (palm leaf), and had the entrance at the side in the upper part. Both birds of the pair were seen coming with building material. A female collected here would have laid eggs within a few days so probably more than one brood is raised a year. In Sierra Leone, both Kemp (1905) and Thompson (1925) speak of this bird as nesting commonly in trees or small bushes or banana trees; once, indeed, a nest was found in a disused Palm Weaver's (*Plesiositagra cucullatus*) nest.

At night the birds resort to their nest-holes in the thatched roofs to sleep, going in one by one, either into separate holes or sometimes a number will sleep in the same one, for Kemp remarks that during the rains they roost in their nests, which may be packed with five or six birds. At dawn old and young set forth in small companies to feed in the rice-fields. They will also fly up into the air from a perch on the roof to catch passing insects, and once during a heavy downpour in late August, we saw them flying up and catching the raindrops for drink. More than once we saw the White-necked Crows searching about on the thatched roofs of native villages, probably looking for the young or eggs of these little birds.

In the juvenal plumage the head, back and wings are uniform dark olive brown, tail blackish; throat like the back, flanks light olive brown, belly washed with ochraceous buff.

Lepidopygia bicolor (Fraser). Black-and-white Waxbill

Amadina bicolor Fraser, Proc. Zool. Soc. London, p. 145, 1842: Cape Palmas.

Size of the preceding or larger, 4 inches; head and entire upper parts, throat, and upper breast black with slight greenish reflections; flanks barred black and white; lower breast, belly, and under tail-coverts white; bill whitish. Female with minute white spots on outer secondaries; bill pale bluish. Portuguese Guinea to Niger.

Similar in general appearance to the last, this species may readily be distinguished in the field by its whitish bill and more black in the plumage. Its habits are quite different in many ways, however, for it does not seem to be closely associated with the human population, but is found in the more open areas, clearings, and edges of rice-fields. In July and August we often saw them in pairs, and sometimes associated with the Thatch-birds in such feeding places. A female taken July 28 on the Du River, had the ovaries large, and may have been about to breed. Büttikofer mentions it from his chief collecting stations and it is undoubtedly common over the more open parts of the country.

Amauresthes fringilloides (LaFresnaye)

Plocus fringilloides LaFresnaye, Mag. de Zool., 1835, pl. 48: "India."

In size like the preceding, but with obviously longer bill; head and neck shining black, back and wings brown, often with fine light spots at the ends of the feathers; rump and tail black; belly and under tail-coverts white; a large black mark on each side of the breast and a pale reddish-brown one on each side of the belly; upper mandible black, lower pale bluish. Gambia to Ogowe and Zanzibar to Natal.

Büttikofer reported having collected this species at various localities, as Schieffelinsville and Robertport, but from the context it is not clear that he did not at times confuse it in the field with the two preceding. Its longer bill, however, is distinctive, and a more recent record is afforded by a specimen from Mount Coffee taken by Currie (Oberholser, 1899, p. 35). We did not meet with it. Kemp (1905) reports it in Sierra Leone associating with the two species preceding and building its nests in the mango and orange trees of the native compounds; he found it common at Rotifunk but at Bo saw it only once in three years' stay. It is probable that it comes into some sort of competition with its associates mentioned, and is perhaps less successful than they. Büttikofer states that its nests were found in November at Robertport near human dwellings and that after the nesting season they collect in flocks, visiting the rice fields and at night sleep in reed growths, perched side by side.

Nigrita canicapilla emiliae Sharpe. Gray and Black Weaver

Nigrita emiliae Sharpe, Ibis, ser. 2, vol. 5, p. 384, pl. 11, 1869: Fanti.

Length 4.75 inches; forehead, sides of head, entire under side, wings, and tail deep black; rest of the upper side blue-gray; iris red. Liberia to Togo.

This beautiful little weaver is non-social in its habits and apparently uncommon in Liberia. Büttikofer in all the course of his collecting mentions but two specimens from Schieffelinsville and one from Jarjee. We first met with it at Kaka Town, where Whitman and I secured a single bird that perched on the top of a small tree. A month later, at Gbanga, two were seen in low trees on the edge of a rice-field fluttering about and chasing each other as if fighting. The one secured proved to be an adult male. On October 3, the men brought in three fledglings and showed us the nest, which they had dislodged from a fork of a tree on the edge of an open field, at a height of perhaps thirty feet. The old birds appeared momentarily at the calls of one of the young, but were wary and quickly disappeared after a brief show of anxiety. In this juvenal plumage the young bird is dull blackish all over, except that the back is slightly grayish. The roof of the mouth is whitish with five black spots: a median large one back of the tip of the beak, then a pair of similar large ones, and farther back a pair of small ones. At the angle of the mouth are on each mandible two small white bead-like papillae, on each side, giving the effect of small seeds projecting from the beak. On October 27, a male was collected at Moylakwelli the stomach of which contained caterpillars and fibrous vegetable matter.

Nigrita bicolor bicolor (Hartlaub). Chestnut-bellied Weaver

Pytelia bicolor Hartlaub, Syst. Verz. Bremen, 1844, p. 76: Gold Coast.

Like the preceding species, but the black areas are chestnut, except the tail which is black. Female slightly smaller. Senegambia to Gold Coast.

This is distinctly a bird of the forest undergrowth, and like its congener is solitary in habit. We saw but three or four in all, while Büttikofer speaks of it at Fisherman Lake, Jarjee, Mt. Olive, and adds that Stampfli shot one in the graveyard at Monrovia. Lowe found a nest with three white eggs at Nana Kru, January 20, 1911, in a small bush three feet from the ground; "the nest was entirely surrounded by red ants, which did not in the least appear to disturb the occupant." Oberholser has recorded it from Mount Coffee.

Spermospiza haematina leonina Neumann

Spermospiza haematina leonina Neumann, Journ. f. Orn., vol. 58, p. 523, 1910: Bo, Sierra Leone.

Length 5.5 inches; male black everywhere except for the scarlet chin, throat, upper breast, and sides of body; bill very heavy, blue with red tip; eyelids white. Female, similar but duller, head and upper tail-coverts tinged with red, the belly and under tail-coverts with many small white spots. West Africa, Senegambia to the Niger.

This handsome black and scarlet weaver is a bird of swampy ground or bushy growth along streams, coming also into rice-fields to feed on the seeds. It is, however, exceedingly wary and in spite of its conspicuous coloring is so secretive that it is very hard to see. Of the seven specimens we secured, all but two were brought in by the natives, who seem able to snare the species easily along the edges of their fields or by the bordering streams. At Gbanga Whitman and I found a pair building a nest on September 22. The birds were bringing material to a spot in the dense top of a large tree that had been felled at the edge of a shaded pool and lay partly in the water. We watched them come and go a few times but they were very shy and showed themselves for a few seconds only. Two days later after a long wait I saw one of them in the early forenoon as it approached the nest, but although I was partly hidden and a number of yards away, it saw me at once and withdrew. Later, on searching the thinly wooded edges of this little pool, I started the pair together from some thick bushes but they disappeared at once into a thicket. On the 25th both birds were collected. The nest was about finished and consisted of the entire tops of a *Dryopteris*-like fern, lined with a mass of grass having finely branched heads. It contained no eggs but the female had one nearly ready for extrusion in the oviduct. The crops of both birds were filled with small white kernels of some species of seed. Büttikofer, who collected specimens at Buluma, Schieffelinsville, Old Field, Hill Town, Farmington and Marfa rivers, mentions a nest from the first-named locality that contained two white eggs. It was placed in a fork four feet from the ground in the underwood of high forest, was ball-shaped with the opening on one side and was composed of soft stalks and grass panicles unlined.

Pyrenestes sanguineus coccineus Cassin. Scarlet-headed Weaver

Pyrenestes coccineus Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1848, p. 67: Monrovia, Liberia.

Length 5.5 inches; heavy-billed weavers, the male with bright scarlet head, throat, rump, flanks, and tail; back, wings, belly, and under tail-coverts and under side of tail olive brown, the back sometimes tinged with scarlet; bill black, eyelids white. Liberia and Sierra Leone.

This brownish instead of blackish race is characteristic of the northern extension of the coast forest. It is a bird of swampy places, especially of bushy growth along streams. We saw it at Gbanga in such situations, especially along the bushy border of a stream flowing through partly cultivated areas whence the birds venture into adjoining rice-fields. They are shy and wary, on the least alarm flying up with many twists and turns, and disappearing in some other part of the swamp. Kemp (1905) has recorded similar habits in Sierra Leone. Büttikofer found at Robertport what seems to have been a small colony of about ten pairs in a swampy grove, though usually the birds are seen either singly or in scattered pairs. He describes the nests as consisting of a heap of dead reeds with a lining of soft grass panicles, and the eggs usually six in number, which seems many for so uncommon a bird. Chapin (Bull. Amer. Mus. Nat. Hist., vol. 49, p. 415–441, 1924) has remarked on the great variation in the size of the bill in this species irrespective of other factors. Our series of three adult males illustrates the same thing, for one has a very much wider beak than the two others and in color is much darker-bellied, almost blackish, with a good deal darker wings.

Ortygospiza atricollis (Vieillot)

Fringilla atricollis Vieillot, Nouv. Dict. Sci. Nat., vol. 12, p. 182, 1817: Senegal and Gambia.

Length about 4 inches; above, grayish brown, the forehead, lores, cheeks, chin, and throat black; breast and sides banded with black and white, or gray-brown and white, breast light reddish brown, with white in the middle of belly washed with yellowish brown; under tail-coverts white streaked with blackish; wings and tail dark grayish brown. West Africa from Senegambia to Gaboon.

Büttikofer's record is the only one for Liberia, namely a bird taken by Stampfli at Monrovia, and recorded as *O. polyzona*, which, as Reichenow has shown, is the proper name for the species of East Africa. Chubb in his list of Liberian birds includes *Zonogastris melba* without comment but probably through inadvertence for this or the following species. It is a weaver of southeastern Africa.

Hypargos schlegeli (Sharpe)

Pytelia schlegeli Sharpe, Ibis, ser. 2, vol. 6, p. 482, pl. 14, 1870: Fanti.

Length 4 inches; olive green above, the upper tail-coverts and throat orange to orange red; eye region, cheeks and chin red; below black, with numerous small white spots, the middle of belly olive green with similar round spots; wings dark blackish brown edged with olive green; tail with the inner vanes of the feathers blackish brown, the outer vanes and all of the middle pair olive green; bill black with red tip and edges. The female has the eye region, cheeks and chin yellowish brown, the lower surfaces dull gray washed with olive. Sierra Leone to the Congo, east to the Lakes.

Birds of this genus are always rare. They frequent thickets of weeds and low growth and are solitary in habit. Büttikofer records but a single bird, a female taken at Robertport, December 14, in brushwood on an old plantation, and I saw one for a brief glimpse in a similar situation on the edge of a field at Paiata, but it very quickly darted back into cover.

Lagnosticta polionota Shelley. Fire Finch; "Thunder-bird" (Kemp)

Lagnosticta polionota Shelley, Ibis, ser. 3, vol. 3, p. 141, 1873: Cape-Coast Castle.

Length 4.25 inches; male with wings and back olive, back of head and crown olive, washed with rosy; rump and under side bright crimson except center of belly and under tail-coverts which are black; a few small white dots on sides of breast. Female similar but duller below, pinkish with buff belly.

Avoiding the forested area, this species seems also to be absent from the coast region of Liberia, for Büttikofer did not meet with it in the Cape Mount region or elsewhere, nor did Lowe find it on the south coast. In eastern Liberia we saw it at Gbanga a number of times and succeeded in securing a pair, the first record for the country. It occurs usually in pairs though once we saw three together, haunting the edges of rice-fields or weed tangles. In walking along the hard-trodden paths through these fields or threading the footpaths through weed jungles, one would occasionally come upon a pair feeding on the open ground, but they would fly up instantly and dash into the nearest weed-patch; again one would mark down the spot where a bird had alighted and walk up to find it gone. They reminded one strongly of Lincoln's Finch in their shyness and secretive ways. Kemp has recorded similar behavior in this species as found in Sierra Leone and mentions hearing a weak plaintive song. Those we saw in September were not heard to sing.

Estrilda melpoda (Vieillot). Orange-cheeked Waxbill

Fringilla melpoda Vieillot, Nouv. Dict. Sci. Nat., vol. 12, p. 177, 1817: West Coast of Africa.

Small, 4 inches long; male with crown gray, back and wings brownish olive, rump scarlet, tail black; cheeks orange red; sides of head and body, under tail-coverts and breast pale bluish gray; chin and middle of abdomen whiter, the belly with a wash of yellowish; bill red. Female slightly duller. Senegambia to Congo.

This little bird is a common species in open places, around the edges of rice-fields or other cultivated ground, frequenting weed growth or short grass to feed on the seeds. We often saw it in small flocks in such places or along the larger cleared paths. Büttikofer records three albinos with red cheeks and upper tail-coverts shot together. A curious belief of the natives is mentioned by Chubb on the authority of Reynolds, that several of these birds will unite to attack and kill small snakes, first picking out the eyes and then cutting the victim into small pieces which are carried to the nests to attract insects on which the young may feed. This is probably the same bird as *Estrelda rhodopyga* of Chubb's list.

Estrilda astrild occidentalis Jardine and Fraser. Banded Waxbill

Estrelda occidentalis Jardine and Fraser, Jardine's Contrib. Orn., p. 156, 1851: Fernando Po.

Small, 4.5 inches; upper parts uniformly olive brown finely barred with dusky, including tail; bill and a small area around eye orange red; chin whitish, under tail-coverts black; rest of under parts finely barred with whitish and olive brown, faintly washed with pinkish. Female slightly duller than the male. Sierra Leone to Cameroons and Loango.

There seems to be no previous record of this species for Liberia though Kemp has reported it from Bo in Sierra Leone, at the time (1905) a considerable extension of its known range for it had not before been taken north of Fernando Po. Our specimen was an adult female shot by Dr. Linder at Bakratown in eastern Liberia on October 1. That it may have been about to breed is indicated by the fact that it contained a partly formed egg. Kemp notes that they feed on the seeds of a feathery grass cultivated by the natives as food.

Vidua macroura (Pallas). Black and White Wydah

Fringilla macroura Pallas, in Vroeg's Catal., Adumbrat., p. 3, 1764: "East Indies" = Africa.

Body small, about 4 inches, but the male in breeding dress with the four central tail-feathers very long, about 8 inches; crown, area in front of eye, upper back, sides of breast, wings (except the coverts) and tail black, the last with inner edges of the short feathers white; lower back olive brown; sides of head, neck-ring, throat, breast, belly, upper and under tail-coverts, and a broad band across base of wing white; bill red. Female streaked brown and blackish above; below, whitish suffused with ochraceous. Senegal to South Africa.

The males of this species in breeding plumage are conspicuous by their long slender tails which whip up and down after them in flight and seem to be an obvious impediment, for the males are soon outdistanced by the shorter-tailed females and younger males. These little birds are rather common about the rice-fields, and also come freely to the native villages, feeding on the ground among low weeds or in patches of bare ground. We saw them in small flocks in August and September, but though a female taken August 21 at Lenga Town had nearly ripe ova we did not see any signs of nesting. Males in adult plumage are about one to three of the dull-plumaged birds, but on September 13, at Gbanga, a flock consisting wholly of males was seen.

ORIOLIDAE Old World Orioles

Oriolus brachyrynchus brachyrynchus Swainson. Gray-winged Oriole

Oriolus brachyrynchus Swainson, Birds West Africa, vol. 2, p. 35, 1837: Sierra Leone.

Size of a thrush, 8.5 inches; head and throat black; back, innermost wing-feathers and their coverts, and two central pairs of tail-feathers olive yellow to yellowish green; outer wing-feathers black edged with gray, the tips of the primary coverts broadly white, forming a conspicuous spot; outer tail-feathers black on the basal half, broadly tipped with yellow; breast, belly, and under tail-coverts yellow. Sierra Leone to Togo.

Büttikofer recorded this oriole as common in forests at various localities where he and his associates collected as at Schieffelinsville, Soforé Place, Cape Mount, Jarjee, and on the Junk and Mesurado rivers, but some of these birds may have been the following which was not at that time distinguished as a separate species. A male shot by Whitman at Kaka Town on August 16 was the only one we observed. No doubt its habitat like that of the other species is the more open forest.

Oriolus nigripennis J. and E. Verreaux. Black-winged Oriole

Oriolus (*Baruffius*) *nigripennis* J. and E. Verreaux, Journ. f. Orn., vol. 3, p. 105, 1855: Gaboon.

Size of the preceding; head and throat black; back, rump, and outer edges of secondaries and all their coverts olive yellow; primaries black with narrow white outer edges; two middle pairs of tail-feathers black narrowly tipped with yellow; breast, belly, and under tail-coverts golden yellow; iris red-brown. Sierra Leone to Loango and the Lakes.

Although Kemp has recorded this bird from Bo, Sierra Leone, it has not hitherto been definitely reported from Liberia. We first saw it in the interior at Banga, where in the late afternoon of October 22 a pair appeared in a large tree with many dead branches, directly behind the village. The male made known his presence by melodious single notes, not very loud. The mate soon appeared in the same tree, and seemed by its actions in examining certain branches to be looking for a nesting site. Two days later at the same place, a third was seen. It flew from a thicket near the village road into an open tree, where it perched in rather nervous fashion, frequently changing its location and calling *o-ri′-o* in melodious tones. Another bird was seen in some tall, thick trees at the edge of the forest near Bomboma. It is evidently a forest-dweller, living singly and in pairs.

DICRURIDAE Drongo Flycatchers

Dicrurus assimilis atactus Oberholser. Fork-tailed Drongo

Dicrurus modestus atactus Oberholser, Proc. U. S. Nat. Mus., vol. 22, p. 35, 1899: Fanti.

Length 10 inches; tail conspicuously forked, its outer feathers with the tips turned outward; entire plumage black with steely blue reflections (instead of greenish as in the typical form). Iris red. West Africa, Liberia to the Niger.

This flycatcher-like starling is a fairly common bird in Liberia, frequenting the open forest, or its edges, often coming about the native villages in the large trees, or haunting the borders of shaded pools of water. Büttikofer, who collected it at a number of places, says that he has seen it sometimes in flocks of as many as ten to twenty individuals in low forest, but in our experience it is usually to be found singly or in pairs. Like other flycatchers it watches for passing insects from a commanding perch, usually a dead branch, launching forth into the air after them. Büttikofer mentions its harsh voice, but in general it is a silent bird. Reichenow does not recognize this as a valid race.

Dicrurus atripennis Swainson. Even-tailed Drongo

Dicrurus atripennis Swainson, Birds West Africa, vol. 1, p. 256, 1837: Sierra Leone.

Size of a thrush, 8 inches; tail not forked; entire plumage black with steely blue reflections above and below. Gambia to Gaboon.

Like the preceding this is a forest bird, and seems to be much the rarer of the two. Büttikofer, in 1885, secured a specimen in young forest behind Monrovia and records others taken in later years at Schieffelinsville, Hill Town, and Johnny Creek. The only one we saw was a male collected by Whitman at Lenga Town. Oberholser has recorded a male in moult, March 16, at Mount Coffee.

STURNIDAE Starlings

Lamprocolius cupreocauda Hartlaub. Glossy Starling

Lamprocolius cupreocauda Hartlaub, Syst. Orn. Westafr., p. 119, 1857: Sierra Leone, Aguapim, Gaboon.

Length 7 inches; entirely blackish with bright blue steely reflections except on occiput, neck, and throat where the reflections are violet, and on the tail where there are very faint bronzy reflections. Iris golden, bill and feet black. Liberia to Gold Coast.

Apparently this starling is of uncommon and sporadic distribution in Liberia. Büttikofer records a male from the Du River, and five specimens from Mt. Olive, Mt. Gallilee, Schieffelinsville, and Paynesville, and he later secured it at Robertport. Bannerman (1912) mentions one collected on the southern coast by Lowe at Nana Kru. We met with it but once, when on September 18 a small flock alighted in the nearly bare top of a high tree in the village compound at Gbanga and two were secured by Coolidge. Büttikofer has suggested that the specimen in the Stettin Museum taken many years before by Schweitzer and recorded as *L. purpureiceps* is undoubtedly this more northern form.

Onychognathus fulgidus hartlaubii G. R. Gray

Onychognathus hartlaubii G. R. Gray in Hartlaub, Proc. Zool. Soc. London, 1858, p. 291: Fernando Po.

Large, 12 inches in length; shining black, the head and neck with steely green, the crown with more bluish reflections; back, lower side, and wing-coverts with purplish sheen; primaries dark reddish brown, black-tipped, the first one all black; iris red, bill and feet black. Female has the head and neck gray, the feathers with black steely streaks. Liberia to Congo, east to Nyam-nyam.

In all the years of his collecting in Liberia, Büttikofer only once took this starling, a male and a female from Mt. Gallilee (Büttikofer, 1889, p. 123). More recently, however, Lowe secured it on the southern coast at Nana Kru (Bannerman, 1912). It is undoubtedly rare or perhaps of only occasional occurrence as a visitor to the less-forested parts of the country.

Cinnyricinclus leucogaster leucogaster (Gmelin). White-bellied Amethyst Starling

Turdus leucogaster Gmelin, Linné's Syst. Nat., ed. 13, vol. 1, pt. 2, p. 819, 1788: Whidah country, Africa.

Length 7 inches; head, throat and upper parts purple, with metallic reflections; rest of under parts white. Female mottled brown above, wings and tail darker; below whitish with an indistinct rufous band across chest. Gambia to 17 degrees south.

According to Büttikofer, who secured a large series from the vicinity of Fisherman Lake, this starling is exclusively a species of open country especially of grassy plains dotted with occasional small trees and thickets. It is therefore largely absent from the forested portions of central and southern Liberia nor did we meet with it in the more open country in eastern Liberia. Possibly too, the season of the year may in part determine its presence, for the family groups wander somewhat in the non-breeding time. Thus Lowe reports it "very common" in January on the southern coast at Settra Kru and Nana Kru, while in Sierra Leone, Thompson (1925) found it commonly in the dry season about Freetown. Although Oberholser notes an immature male from Mount Coffee sent by Currie, the general distribution of the species seems to be the open coastal country, especially of the northern part of Liberia bordering the unforested areas of Sierra Leone.

CORVIDAE Crows and Jays

Corvus albus P. L. S. Müller. White-necked Crow

Corvus albus P. L. S. Müller, Linn. Natursys., Suppl. u. Register-Band, vol. 1, p. 85, 1776: Senegal.

Length 19 inches; plumage shining black except for the white neck and breast.

It is unfortunate that the older name *albus* must replace the well-known name *scapulatus* for this crow. It is a bird widely distributed in Africa, but in Liberia avoids the forest altogether and is very distinctly a hanger-on of man, frequenting the neighborhood of the native villages, the clearings and cultivated fields, or the oil-palm groves that are more or less under human supervision. Indeed, it was noticeable in our journey across the country, that one might walk for hours along the forest trails and presently hearing the calls of these birds, receive the first intimation that a native village with its clearings and rice-fields was at hand. They often come about the thatched huts, alighting on the roofs to hunt for the eggs or young of the little Hooded Waxbills. Büttikofer found them common along the coastal towns, in estuaries of rivers and on seashores, living on the fish, crayfish, and mollusks left by the tide. He adds that in the oil-palm season, from February to May, they feed largely on these nuts and their flesh is then much in demand among the natives. During the season of our visit, July to November, we saw no sign of breeding, but the birds were nearly always in small companies up to half a dozen. At Kaka Town, on August 23, we saw a large flock of between thirty and forty birds. In the southern part of the coast it is less common, though Büttikofer says it was found by him along the lower parts of the Junk, St. John's, Cestos, and Sino rivers. Curiously, it did not seem to be present in the immediate vicinity of Monrovia, though doubtless to be found among the outlying villages.

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BIRDS COLLECTED IN THE BELGIAN CONGO

By Herbert Friedmann

In June 1926, the Department of Tropical Medicine of the Harvard University Medical school sent a large, well-equipped expedition to equatorial Africa to study the biological and medical problems of that region. The Expedition, under the leadership of Dr. R. P. Strong, went first to Liberia. Dr. Glover M. Allen accompanied the Expedition as Zoologist in this country and made extensive collections on which he has prepared special articles which are published in Chapters XXXIII and XXXIV of this Report. While in Liberia he gave additional instruction to two of the other members of the Expedition in collecting and preparing birds. That his efforts were not in vain is shown by the present collection made in the Belgian Congo by Mr. Loring Whitman, assistant Ornithologist and photographer, and by Dr. D. H. Linder, the Botanist of the Expedition, when time could be spared from their other duties. Great credit is due to both Whitman and Linder for the small but very creditable collection they made. The skins are well prepared and aside from their scientific value, constitute a welcome addition to the African collections of the Museum of Comparative Zoölogy, where they now are.

Of the specimens included in the present report the first were collected at São Thomé Island, on November 27, while on board ship en route from Liberia to the mouth of the Congo. The remainder were secured during the route of the Expedition along the Congo River from its mouth to Kabalo, thence by train to Albertville on Lake Tanganyika, by lake steamer to Uvira, thence on foot north along the Ruzizi valley to Lake Kivu, across Lake Kivu to Kibati, and the volcanic regions of Burunga and Lulenga, and thence to Angi and the Ruchuru plains. Here the Expedition was divided into several groups for special work, and the collecting of birds was not further pursued.

Inasmuch as some of the collecting localities are not shown on most maps it may be well to list them with notes of their location.

ANGI: Belgian Congo, a short distance south of Ruchuru; about half-way between Lake Kivu and Lake Edward; 1° 15′ S.; 29° 20′ E.
BUDJA-LIA: Belgian Congo, a short distance west of Budjalibala.
BUDJALIBALA: Belgian Congo, north bank of Congo River; approx. 2° N.; 20° 50′ E.
BUKAVU: Belgian Congo, south end of Lake Kivu; 2° 30′ S.; 28° 50′ E.
BUMBA: Belgian Congo, north bank of Congo River; approx. 2° 10^{1} N.; 22° 30′ E.
BURUNGA: Belgian Congo, volcanic district north of Lake Kivu; 1° 30′ S.; 29° 20′ E.
EFANDU: Belgian Congo, north bank of Congo River; approx. 1° 45′ N.; 23° 20′ E.
KAMANIOLA: Belgian Congo, in the valley of Ruzizi River, a short distance south of Nya Gezi, north of Luvungi; 2° 45′ S.; 29° E.
KASSA: French Congo, near the junction of the Ubangi and the Congo rivers; 1° 10′ N.; 17° 25′ E
KIBATI: Belgian Congo, north of Lake Kivu; 1° 35′ S.; 29° 20′ E.
KINSHASA: Belgian Congo, short distance northeast of Leopoldville, at the southwest end of Stanley Pool; 4° 20′ S.; 15° 20′ E.
KWAMOUTH: Belgian Congo, at junction of Kasai and Congo rivers; 3° 20′ S.; 16° 10′ E.
LOANGO: on the coast of French Congo; approx. 4° 35′ S.; 11° 45′ E.

Lokutu: Belgian Congo, on the Congo River, short distance west of Mobeka; 1° 45′ N.; 19° 30′ E.

Lulenga: Belgian Congo, between Burunga and Angi; 1° 20′ S.; 29° 20′ E.

Lusengo: Belgian Congo, on the Congo River, between Nouvelle Anvers and Lokutu; 1° 45′ N.; 19° 25′ E.

Luvungi: Belgian Congo, valley of Ruzizi River, half way between Lakes Tanganyika and Kivu; approx. 2° 50′ S.; 29° E.

Mistandungu: Belgian Congo; on the Congo River, northwest of Bolobo; approx. 2° S.; 16° 30′ E.

Mobeka: Belgian Congo, on the Congo River, near the junction of the Mongala and Congo rivers; approx. 2° N.; 19° 50′ E.

Mt. Mikeno: a volcanic mountain a short distance east of Burunga; 1° 30′ S.; 29° 25′ E.

Nganchu: French Congo, across from and a little to the southwest of Kwamouth, Belgian Congo; approx. 3° 18′ S.; 16° 5′ E.

Ngomo: Belgian Congo, a rest station just outside of Nya Gezi; 2° 35′ S.; 28° 50′ E.

Nya Gezi: Belgian Congo, in the Ruzizi Valley, between Kamaniola and Bukavu; 2° 35′ S.; 28° 55′ E.

São Thomé: an island in the Gulf of Guinea.

Uvira: Belgian Congo, north end of Lake Tanganyika; 3° 25′ S.; 29° 10′ E.

Yalembe: Belgian Congo, on the Congo River, short distance above Basoko; approx. 1° 10′ N.; 23° 50′ E.

Annotated List of the Birds Collected

Ardeidae

Ardea melanocephala Vigors and Children

Ardea melanocephala Vigors and Children, in Denh. & Clapp. Trav. ii, App. xxi, p. 201, 1826: probably near Lake Chad.

Female, Luvungi, 31 January 1927.

This specimen agrees with a series in the Museum of Comparative Zoölogy, and presents no individual peculiarities.

The iris is recorded as yellow. I notice that Gyldenstolpe (Kungl. Sv. Vet. Akad. Handlgr., 1924, p. 293) records the iris as orange red or dirty white.

Bubulcus ibis ibis (Linné)

Ardea ibis Linné, Syst. Nat. 10th ed., p. 144, 1758: Egypt.

Male, Kamaniola, 2 February 1927.

The iris is recorded as yellow.

Falconidae

Milvus migrans parasitus (Daudin)

Falco parasitus Daudin, Traité d'Orn. ii p. 150, 1800: South Africa.

Female, Kibati, 27 March 1927.

The present bird agrees with a series from various parts of Africa in the Museum of Comparative Zoology.

"Skull completely ossified; ovary very small" — collector's note.

Elanus caeruleus caeruleus (Desfontaines)

Falco caeruleus Desfontaines, Hist. (Mém.) de l'Acad. R. des Sc. Paris, p. 503, pl. xv, 1787–1789: environs of Algiers.

Male, Kamaniola, 2 February 1927.

Not fully adult; the back and the top of the head are largely brownish; the underparts streaked narrowly with brownish.

Circus macrourus (Gmelin)

Accipiter macrourus Gmelin, Nov. Comm. Acad. Petropol. xv, p. 439, pl. viii, ix, 1771 (pr. 1770): Woronez.

Female, Bumba, 1 January 1927.

This bird is darker than a female, in the Museum of Comparative Zoölogy, from Dinder River, eastern Sudan.

Phasianidae

Francolinus squamatus zappeyi (Mearns)

Francolinus schuetti zappeyi Mearns, Smiths. Misc. Coll., lvi, no. 20, p. 4, 1911: eastern shore of Lake Victoria.

Female, Kibati, 25 March 1927.

The flanks, thighs, and lower abdomen are bare in this specimen. This is a valid race and includes *dowashanus* as a synonym.

Rallidae

Crecopsis egregia (Peters)

Ortygometra egregia Peters, Monatsb. Akad. Berlin, 1854, p. 134: Tete, Zambesi.

Male, off Loango, French Congo, 29 November 1926.

This bird flew on board ship fifteen or twenty miles off shore. The comparative material of this species available for study is slight, but the present specimen is noticeably darker above and below than a male from Metet, Cameroon.

Limnocorax flavirostra (Swainson)

Gallinula flavirostra Swainson, Birds West Africa, ii, p. 244, pl. 28, 1837: Senegal.

Male, female, Bukavu, 6 February 1927.

The female is darker and smaller than the male.

Balearicidae

Balearica regulorum gibbericeps Reichenow

Balearica gibbericeps Reichenow, Jour. f. Orn., 1892, p. 126: Lake Jipe (near Kilimanjaro).

Ad. unsexed, Kamaniola, 1 February 1927.

Downy chick, unsexed, s. w. foot Mt. Mikeno, 22 March 1927.

The downy chick was taken from a nest containing two young. The nest was in a boggy meadow at an altitude of 7,250 ft.

The native name is recorded as "*malu.*"

Charadriidae

Afroxyechus forbesi (Shelley)

Aegialitis tricollaris forbesi Shelley, Ibis, 1883, p. 560: Shonga on the Niger.

Female, Bumba, 2 January 1927.

This apparently constitutes the first written record for this bird for the

Belgian Congo. Sclater (Syst. Avium Ethiop., 1924, p. 120) gives the range of *forbesi* as West Africa from Senegambia to Cameroon, so that the present specimen sets a new eastern limit to the known range of this species.

Scolopacidae

Erolia testacea (Pallas)

Tringa testacea Pallas, in Vroeg's Cat. Adumbrat. 1764, p. 6: Holland.

Male, Kwamouth, 15 December 1926.

Actitis hypoleucus (Linné)

Tringa hypoleucus Linné, Syst. Nat., 10th ed., 1758, p. 149: Europe; restricted type locality, Sweden.

Female, Nganchu, French Congo, 13 December 1926.

Both these European migrants are widely distributed in Africa during the northern winter.

Burnhinidae

Burhinus capensis capensis (Lichtenstein)

Oedicnemus capensis Lichtenstein, Verz. Doubl., p. 69, 1823: Cape of Good Hope.

Female, Kamaniola, 1 February 1927.

The iris is recorded as yellow in color.

Neither Sclater (Syst. Avium Ethiop., 1924, p. 42) nor Meinertzhagen (Ibis, 1924, p. 344) record this race from the Belgian Congo. According to the latter the bird from Kamaniola should be *capensis* on geographic grounds. It is similar to a specimen of the typical form from Guaso Nyiro, Kenya Colony, in the collection of the Museum of Comparative Zoölogy, but more reddish than some from the regions farther south (South Africa, etc.). I have not seen any other specimens of *Burhinus capensis* from the Belgian Congo, but it has been recorded from that country before this. It is likely that all the records refer to typical *capensis*. However, it may be that the birds from the northeastern parts of the Uelle are intermediate between *capensis* and *maculosus*. Meinertzhagen (*cit. supra*) writes that a specimen from the Bahr-el-Ghazal is of this intermediate nature.

Laridae

Sterna fuscata Linné

Sterna fuscata Linné, Syst. Nat., 12th ed., 1766, p. 228: S. Domingo.

Male, São Thomé Island, 27 November 1926.

This specimen is a typical adult in good plumage.

Anous stolidus stolidus (Linné)

Sterna stolida Linné, Syst. Nat., 10th ed., 1758, p. 137: American Seas: restricted type locality, West Indies.

Female, São Thomé Island, 27 November 1926.

Columbidae

Streptopelia semitorquata semitorquata (Rüppell)

Columba semitorquata Rüppell, N. Wirbelth., Vög. p. 66, pl. 23, fig. 2, 1837: Taranta Mts. Ethiopia.

Male, Burunga, 23 March 1927.

I refer this specimen to the present race often known as *erythrophrys* which latter is not too well established. The bird is darker on the upper parts than several other males from Liberia, Cameroon, and Kenya Colony, but the coloration is quite variable as is shown by a long series in the collections of the Museum of Comparative Zoölogy. The present specimen has an unusually small bill, the culmen measuring only 15.3 mm. The wing measures 178 mm.

Erlanger described *S. semitorquata intermedia* from Shoa because his specimens from that region had the brown of the upper parts a shade darker, and were slightly smaller in size than typical *semitorquata*. However, the present specimen from the Congo exhibits all these characters and even exceeds *intermedia* in the darkness of the upper parts, indicating the range of non-geographic variation possible in this pigeon.

Tympanistria tympanistria fraseri Bonaparte

Tympanistria fraseri Bonaparte, Consp. Gen. Av. ii. 1854, p. 67: Fernando Po.

Immature female (?), Kibati, 28 March 1927.

This specimen is molting and is in poor plumage for study. According to collector's notes the skull was not completely ossified; the ovary very small.

Cuculidae

Centropus superciliosus loandae C. H. B. Grant

Centropus superciliosus loandae C. H. B. Grant, Bull. Brit. Orn. Cl., xxxv, 1915, p. 54: N'Dalla Tando, northern Angola.

Male, Lulenga, 7 March 1927.

This individual agrees with a small series from various parts of its range in the Museum of Comparative Zoölogy.

The East African form *C. superciliosus furvus* is not distinct from typical *superciliosus*.

Musophagidae

Musophaga rossae rossae Gould

Musophaga rossae Gould, Proc. Zool. Soc. Lond., 1851, p. 93: Loanda (Cf. Grant, Ibis, 1915, p. 413).

Male, Ngomo, 3 February 1927.

This specimen agrees with others from Uganda, Kenya Colony, and Tanganyika Territory, in the Museum of Comparative Zoölogy. The species apparently has rather narrow limits of variation, if the small series examined gives a proper idea of its variability.

Crinifer zonurus (Rüppell)

Chizaerhis zonurus Rüppell, N. Wirbelth., Vög., p. 9, pl. iv, 1835: Temba Province, Abyssinia.

Male, Luvungi, 30 January 1927.

This bird was collected by M. G. Babault who kindly presented it to the Expedition.

The present species seems to be fairly common in the eastern Congo but Sclater (Syst. Avium Ethiopicarum, 1924, p. 195) does not include eastern Congoland in its range, although it has been taken by several collectors such as Grauer, Pauwels, Piscicelle, and Pilette, in the Ruanda, Urundi, the Ruzizi, and Semliki valleys, and on the west shore of Lake Tanganyika. Although very distinct from typical *piscator*, *zonurus* is closely related to it, as intermediates do occur, but the caudal bands are invariable.

Coraciidae

Coracias caudatus caudatus Linné

Coracias caudatus Linné, Syst. Nat. 12th ed., i, p. 160, 1766: Angola.

Male, Luvungi, 30 January 1927.

This roller is a common bird in all the savannas of the southern Congo from Lake Tanganyika to the Kasai. It has been taken in the Ruzizi Valley by Pauwels and by Kandt near Lake Kivu. Sclater (Syst. Avium Ethiop., 1924) does not include the Congo in its range.

Eurystomus afer afer (Latham)

Coracias afer Latham, Ind. Orn. i, 1, 172, 1790: Africa.

Adult female and immature female, Bumba, 31 December 1926.

I have identified these birds as typical *afer* because the adult has the entire undersurface and cheeks strongly washed with purplish-lilac, and the central upper tail-coverts are brownish. Sclater and Mackworth-Praed (Ibis, 1919, pp. 673–674) have reviewed the races of this species. I have examined all available material and find their conclusions are supported by the series in the Museum of Comparative Zoölogy, as far as the material goes.

Alcedinidae

Ispidina picta picta (Boddaert)

Todus pictus Boddaert, Tabl. Pl. Enlum., p. 49, 1783: St. Louis, Senegal.

Female, Bumba, 30 December 1926.

Male, Bumba, 2 January 1927.

The female has a larger bill than the male. Except for the fact that the male has the middle of the abdomen almost whitish these birds agree with others from Uganda, Kenya Colony, and Cameroon, in the Museum of Comparative Zoölogy.

Corythornis leucogaster leopoldi (Dubois)

Ipsidina leopoldi Dubois, Ann. Mus. Congo, fasc. i, p. 10, pl. 6, fig. i, 1905: Lake Leopold, Middle Congo.

Male, Bumba, 2 January 1927.

As far as I know this is the second specimen of this very rare kingfisher to come to American museums, the other being an adult female collected near Avakubi, Ituri district, by the American Museum Congo Expedition (H. Lang and J. P. Chapin), and now in the American Museum of Natural History.

Chapin (Ibis 1922, pp. 443–445) has described his specimen fully. The present individual is a male, not fully adult, and differs from the description of the adult female given by Chapin in the following particulars: forehead black only medially, encroached upon laterally by the pale rufous lores which are spotted with black only in the immediate preocular portion; malar region and cheeks rufus narrowly barred with black; breast grayish brown becoming rich rufous laterally; above as in adult female except that the middle of the back is bright light blue, not bluish-violet like the upper tail coverts; bill brownish in dried skin, light at tip; feet yellowish in dried skin; wing 53; tail 22.5; culmen from base 29.5 mm.

The known distribution of this rare bird becomes somewhat more intelligible with the discovery of this specimen. Previously it was recorded from Lake Leopold, Tondu, Bolobo, Kunungu, and from the Ituri Forest at Avakubi where Chapin observed and collected a single specimen along a small forest brook. The two extreme localities are about 650 miles apart in a straight line. Bumba is almost exactly half way between the two, following the Congo River system. This kingfisher ranges right across the Congo forest, keeping close to the larger waterways.

Meropidae

Melittophagus variegatus loringi Mearns

Melittophagus variegatus loringi Mearns, Proc. U. S. Nat. Mus. xlviii, 1915, p. 293: Butiaba, Lake Albert, Uganda.

Male, female, Bumba, 30 December 1926.

These birds agree with Uganda specimens in having fairly well-developed blue superciliary stripes, but are slightly smaller (wing 86.5 male; 82 mm. female). Grant (Ibis, 1915, pp. 297–298) writes that the characters on which Mearns described *loringi* do not hold. These characters are larger size with paler yellow underparts. However, Grant notes that all East African birds have well-developed superciliary stripes while West African specimens have either incomplete ones or none at all. So then the character of the superciliary stripe seems to be the only constant difference between *loringi* and *variegatus*. Now, these Bumba (West African) specimens show that western birds may sometimes have well-developed superciliaries. A bird in the Museum of Comparative Zoölogy, from the Cameroon also has slight blue superciliaries. This means either of two things: — that *loringi* is not distinct, or that it extends further west than hitherto thought. The latter seems the true solution. In this connection Dr. James P. Chapin informs me that *loringi* is a more northern form extending right across to West Africa north of the Congo forest.

The southern race *bangweoloensis* I have not seen, but it seems very distinct, judging from literature, and the colored figure published in the Ibis for 1915.

Coliidae

Colius striatus kiwuensis Reichenow

Colius kiwuensis Reichenow, Orn. Monatsb., 1908, p. 191: Lake Kivu.

Two males, Kamaniola, 31 January 1927.

Adult female, immature female, Lulenga, 5 March 1927.

The immature bird has the lower mandible wholly black. The wing coverts are tipped with sandy rufous and the feathers of the back are broadly tipped with light tawny.

The males are somewhat browner above, and especially on the rectrices, than the adult female.

Capitonidae

Pogoniulus scolopaceus flavisquamatus (Verreaux)

Barbatula flavisquamata J. and E. Verreaux, Journ. f. Orn., 1855, p. 101: Cape Lopez, Gaboon.

Male, Efandu, 5 January 1927.

This specimen agrees with the characters of this race. It has a short, stout bill (stouter than either *scolopaceus* or *aloysii*) and is more olive, less yellow than *scolopaceus*. I have seen no specimens of *stellatus*.

P. s. consobrinus Reichenow is probably a synonym of *flavisquamatus*.

Gyldenstolpe (Kungl. Sv. Vet. Akad. Handlngr., 1924, pp. 244–245) records the Uganda form *aloysii* from the Semliki Valley, eastern Belgian Congo. This is more western than the limits given by Sclater (Syst. Avium Ethiop. 1924, p. 284). In the Museum of Comparative Zoölogy are two males of this race (*aloysii*) from slightly farther west even than Gyldenstolpe's birds — from the Beni-Irumu forest on the western edge of the Semliki Valley, where most of the birds are of West African forms.

Muscicapidae

Terpsiphone viridis speciosa (Cassin)

Muscipeta speciosa Cassin, Proc. Phil. Acad., 1859, p. 48: Kamma River, Gaboon.

Male, Bumba, 31 December 1926.

This specimen has absolutely no brown in the plumage; the tail and the back, rump and inner wing coverts are white, while the interscapulars are black, broadly margined with white. A male (M.C.Z. 81340) from Metet, Cameroon, is similar except that the back and rump are chiefly blackish, while another from Efulup, Cameroon, has the interscapulars, back, and rump splotchy in appearance, — brown, black, and white. Both Cameroon birds have the long rectrices entirely white save for narrow basal black margins and black bases to the shafts, while the present Congo specimen has the entire shafts and a broad terminal area of the vexillum of both webs black.

The description of *melampyra* Hartlaub (Syst. Orn. W. Afr., 1857, p. 90), is practically unidentifiable, and the name should therefore be synonymized.

Laniidae

Lanius collaris congicus Reichenow

Lanius humeralis congicus Reichenow, Jour. f. Orn., 1902, p. 258: Angola.

Male, Lulenga, 4 March 1927.
Female, Lulenga, 7 March 1927.

These birds are more sooty above than *L. c. smithi.* The characters of the outer tail-feathers do not seem to hold consistently for the races of the fiscal shrike.

Laniarius ferrugineus major (Hartlaub)

Telephonus major Hartlaub, Rev. Zool., 1848, p. 108: Elmina, Gold Coast.

Male, Lulenga, 7 March 1927.

The single specimen collected agrees with East African (Kenya Colony) examples in the Museum of Comparative Zoölogy.

Corvidae

Corvultur albicollis (Latham)

Corvus albicollis Latham, Ind. Orn. i, p. 151, 1790: Africa.

Male, Kibati, 26 March 1927.

This specimen agrees with a series from Kenya Colony and Uganda.

Corvus albus P. L. S. Müller

Corvus albus P. L. S. Müller, Natursyst., Anhang., p. 85, 1776: Senegal.

Male, Angi, 1 April 1927.

Agrees with a series in the Museum of Comparative Zoölogy.

Buphagidae

Buphagus africanus megarhynchus Grote

Buphagus africanus megarhynchus Grote, Orn. Monatsb., 1927, pp. 11–13: the Kivu district, Belgian Congo.

Male, Luvungi, 30 January 1927.

This specimen is rather large, having a wing of 125 mm., agreeing with Grote's description of this form.

The iris is recorded by the collector as red.

Eulabetidae

Lamprotornis purpuropterus purpuropterus Rüppell

Lamprotornis purpuroptera Rüppell, Syst. Uebers. Vögel N. O. Afr., 1845, p. 64, pl. 25: Shoa.

Female, Luvungi, 31 January 1927.

This specimen agrees fairly well with a female from Mutir, West Nile, Uganda, but is more bluish, less greenish on the breast than the latter, and slightly larger.

Pycnonotidae

Andropadus gracilis gracilis Cabanis

Andropadus gracilis Cabanis, Orn. Centralbl., 1880, p. 174: Angola.

Male, Kinshasa, 8 December 1926.

This specimen (which unfortunately lacks a tail) is lighter on the sides and flanks than a male from Sakbayeme, Cameroon, with which it otherwise agrees.

Andropadus virens virens Cassin

Andropadus virens Cassin, Proc. Acad. Phil., 1857, p. 34: Cape Lopez and Muni River, Gaboon.

Female, Kassa, French Congo, 17 December 1926.

Agrees with others from Cameroon and French Congo in the Museum of Comparative Zoölogy.

Stelgidillas gracilirostris congensis Reichenow

Stelgidillas gracilirostris congensis Reichenow, Orn. Monatsb., 1916, p. 181: Leopoldville.

Male, Kinshasa, 8 December 1926.

This individual agrees with the description of *congensis* in that the under tail-coverts are slightly paler, the upper parts somewhat darker, and the bird slightly larger than typical *gracilirostris*.

Atimastillas simplex (Hartlaub)

Trichophorus simplex Hartlaub, Jour. f. Orn., 1855, p. 356 (ex. Temm.): Gold Coast.

Male, Lusango, 23 December 1926.

A male from Sakbayeme, Cameroon, is somewhat lighter than the present bird.

Pycnonotus tricolor tricolor Heuglin

Pycnonotus nigricans var *minor* Heuglin, Orn. N. O. Afr. i, 1869, p. 398. Upper White Nile.

Male, Mobeka, 24 December 1926.

Male and female, Bumba, 3 January 1927.

These birds agree with others, in the Museum of Comparative Zoölogy, from Omboue, Fernan Vaz, and with the characters given by Gyldenstolpe (Kungl. Sv. Vet. Akad. Handlngr., 1924, pp. 187–189).

Nectariniidae

Nectarinia kilimensis filiola Hartlaub

Nectarinia filiola Hartlaub, Jour. f. Orn., 1890, p. 150: Njangalo, Tanganyika Territory.

Immature male, Lulenga, 1 March 1927.

Adult male, Lulenga, 8 March 1927.

Adult male, Kibati, 27 March 1927.

These birds agree with Hartlaub's description of *filiola*, having the rump and back purplish bronzy. However, the male from Kibati is more like typical eastern birds, having only a very slight wash of purplish in some of the feathers.

Nectarinia congensis Oort

Nectarinia congensis Oort, Orn. Monatsb., xviii, 1910, pp. 54–55: Lower Congo.

Male and female, Bumba, 1 January 1927.

These two birds agree with the description of this species, which I have not otherwise seen except in the American Museum of Natural History, where Dr. James P. Chapin showed me his excellent series, but with which I have not compared the present specimens.

Cinnyris cupreus chalceus (Hartlaub)

Nectarinia chalcea Hartlaub, Ibis, 1862, p. 341: Cambambe, Angola.

Male, Luvungi, 31 January 1927.

Bannerman (Rev. Zool. Afr., ix 1922, pp. 327–328) restricts *chalceus* to Angola, but Gyldenstolpe (Kung. Sv. Vet. Akad. Handlngr., 1924, pp. 87–88) has shown that many of the characters of *chalceus* as given by Hartlaub do not hold and that the only difference between it and typical *cupreus* is that the former is larger and has a longer bill. Birds of this type range east to the Semliki valley and to the eastern Congoland generally.

Cinnyris chloropygius orphogaster Reichenow

Cinnyris chloropygius orphogaster Reichenow, Orn. Monatsb., 1899, p. 169: Bukoba, w. of Victoria Nyanza.

Male, Bumba, 2 January 1927.

The bird was in breeding condition when collected. It has a wing of 50 mm. which agrees with the measurements of Gyldenstolpe's birds from the eastern Congo (Semliki Valley). Bannerman (Rev. Zool. Afr., ix, 1922, pp. 330–333) writes that Uganda birds have wings of from 52–55.5 mm. while birds from the Uelle and Aruwimi rivers have wings of from 49–52.5 mm. Two males from Ruanda, Uganda (M.C.Z. 95533 and 95534) have wings of 52 and 53.5 mm., respectively. One of them (M.C.Z. 95534) has bright purple upper tail coverts and a purple margin to the green throat.

Sylviidae

Cisticola lugubris amphilecta Reichenow

Cisticola lugubris amphilecta Reichenow, Jour. f. Orn., 1875, p. 144: Accra, Gold Coast.

Two males, Bumba, 2 January 1927.

These two birds probably belong to the western race, *amphilecta*. They have longer, more slender culmens than *nyansae*, and are very slightly darker. The difference between *amphilecta* and *nyansae* is not great, however. In this connection it is interesting to note that Gyldenstolpe (Kungl. Sv. Vet. Akad. Handlngr., 1924, p. 132) writes that his specimens from Angi, west of Lake Edward, are intermediate between *amphilecta* and *nyansae*, although he records them under the latter name.

Cisticola chubbi Sharpe

Cisticola chubbi Sharpe, Ibis, 1892, p. 157: Kimangitchi, Mt. Elgon.

Female, Lulenga, 2 March 1927.

Agrees with specimens of typical *chubbi* in the Museum of Comparative Zoölogy.

Cisticola rufopileata Reichenow

Cisticola rufopileata Reichenow, Journ. f. Ornith., 1891, p. 69: River Nun, S. Nigeria.

Adult female, Yalembe, 7 January 1927.

This specimen agrees fairly closely with the description of *emini* Reichenow, having the top of the head and the hind neck distinctly reddish brown sharply demarked from the earth-brown of the back, much redder than the rump.

Cisticola erythrops sylvia Reichenow

Cisticola sylvia Reichenow, Orn. Monatsb. 1904, p. 28: Ulegga, near south end of Lake Albert.

Female, Lulenga, 1 March 1927.

The single specimen collected must be referred to *sylvia* according to information received from Admiral Lynes who is monographing this difficult genus.

Prinia mistacea melanorhyncha (Jardine and Fraser)

Drymoeca melanorhynchus Jardine and Fraser, Contr. Orn., 1852, p. 60: Abomey, Dahomy.

Male and female, Mobeka, 24 December 1926.

These two specimens agree very well with the description of *melanorhyncha* which I have not otherwise seen.

Turdidae

Saxicola torquata axillaris (Shelley)

Pratincola axillaris Shelley, Proc. Zool. Soc. Lond., 1884, p. 556: Kilimanjaro.

Male and female, Lulenga, 8 March 1927.

Meinertzhagen (Ibis, 1922, pp. 20–29) writes that the birds of the eastern Belgian Congo are *axillaris*. The present birds are not *salax* (type loc. Gaboon) as they have black axillars, but they have fairly wide white tips to the axillars in which character they approach *salax*. The axillars are smoky brown, widely tipped with white in *salax* and are black narrowly tipped with white in *axillaris*.

Bessanornis heuglini occidentalis (Reichenow)

Cossypha heuglini occidentalis Reichenow, Journ. f. Orn., 1909, p. 108: Lufuku, west of Tanganyika.

Male, Kamaniola, 2 February 1927.

B. h. occidentalis differs from typical *heuglini* in being darker on the breast and more rusty on the upper parts. This specimen has a wing of 100 mm., while a male of *heuglini* from Ruanda (M.C.Z. 95487) has a wing of 97 mm.

Erythropygia hartlaubi Reichenow

Erythropygia hartlaubi Reichenow, Jour. f. Orn., 1891, p. 63: Mutzora, Semliki Valley, eastern Belgian Congo.

Male, Kamaniola, 2 February 1927.

This specimen has a slightly longer culmen than a male from Nairobi, Kenya Colony, and also has the basal half of the rectrices and upper tail-coverts darker than in the Nairobi bird. Dr. van Someren (Nov. Zool., xxix, 1922, p. 237) writes that his Kenya specimens are very much darker on the mantle than Uganda birds and have the crown almost black and he suggests that they may be separable. The present specimen from the Belgian Congo is generally darker than the Nairobi bird, which indicates that the birds are variable and that the eastern birds may not be separable. Gyldenstolpe gives Bukoba as the type locality, but he is mistaken in this.

Timeliidae

Turdoides hartlaubi ater Friedmann

Turdoides melanops ater Friedmann, Proc. N. Eng. Zool. Cl., 1927, p. 11: Kamaniola, Belgian Congo.

Male, Kamaniola, 2 February 1927.

The present specimen is the type, and so far as I know, the only example of this race. It is darker above and below than any specimens of *hartlaubi* examined, but may prove to be merely an individual variation.

Measurements: wing 110.5; tail 109; culmen from base 19.5 mm.

When I described this bird I put it in the species *melanops* by mistake as the white rump feathers were almost gone, giving it the appearance of *melanops*.

Illadopsis fulvescens fulvescens (Cassin)

Turdirostris fulvescens Cassin, Proc. Acad. Phil., 1859, p. 54: Camma River, Gaboon.

Female, Bumba, 31 December 1926.

I include this specimen under this race on geographic grounds. It agrees as much with *ugandae* van Someren as with typical *fulvescens*, but is smaller (wing 70 mm.) than either. It has no shaft streaks on the feathers of the throat, thereby agreeing with *ugandae*, otherwise it is exactly like typical *fulvescens* from Cameroon and Liberia, but in size approaches *pumilus*.

Motacillidae

Motacilla aguimp Dumont

Motacilla aguimp Dumont, Dict. Sci. Nat., xxi, 1821, p. 226: Orange River, Namaqualand.

Male, Mobeka, 24 December 1926.

The white superciliary stripes in this specimen are broader in front of the eyes than in a series from Cameroon, Kenya Colony, and South Africa, in the Museum of Comparative Zoölogy.

Budytes flava thunbergi (Billberg)

Motacilla thunbergi Billberg, Synopsis Faunae Scandinaviae, tom. i, pt. 2, Aves, 1828: Sweden.

Male, Bumba, 30 December 1926.

This specimen agrees with other examples of *thunbergi* in the Museum of Comparative Zoölogy in that it lacks the superciliary stripes of typical *flava*. There are, however, a very few small whitish feathers behind the eyes.

Budytes flava flava is undoubtedly the commonest of the races of this wagtail that visit the Congo, but there is no basis for the belief that *thunbergi* is unusual in that country. The latter has been reported from Mazanguli, upper Lualaba Valley by Neave (Ibis, 1910, p. 237); from Baraka and Irumu, Ituri district, by Sassi (Ann. K. K. Naturhist. Hofmus. Wien, xxxviii, p. 40); and is mentioned as seen alive near Bolobo by Schouteden (Rev. Zool. Africaine, xiii, no. 1, 1925, p. 13). Dr. Chapin writes me that he has one male from Ibambi, near Medje, taken 12 April 1910, and another collected by Father Callewaert at Luluabourg, Kasai district, 14 January 1926.

Judging by the Bolobo record, it might be expected that this bird migrates across the upper Congo, — an expectation that is more or less corroborated by the present specimen. As far as I know, this bird has not hitherto been recorded from the true forest area of the Congo Basin, but Dr. J. Bequaert informs me that there is a large clearing at Bumba, which may account for the presence of this bird at that place.

Ploceidae

Passer griseus ugandae Reichenow

Passer diffusus ugandae Reichenow, Orn. Monatsb., 1899, p. 110: Uganda.

Male, Efandu, 5 January 1927.

Female, Lulenga, 1 March 1927.

The female specimen has the underparts washed with sandy buff. It agrees with others from Masindi, Uganda, and Ruchuru, Belgian Congo, in the collections of the Museum of Comparative Zoology. The male has the crown and nape slightly more grayish, less brownish, than the female, and is interesting in that Gyldenstolpe records *zedlitzi* from the Semliki valley. This race (type locality Benguella Town, Angola) is said to be more grayish on the crown than *ugandae*, and, therefore, more or less like the present male from Efandu. However, a specimen from Angola (Boulton coll.) in the American Museum of Natural History does not agree with the characters of *zedlitzi*. Even if this form were valid, which it apparently is not, Gyldenstolpe's Semliki bird could hardly be anything but a grayish specimen of *ugandae*, probably similar to the present one.

Vidua macroura (Vroeg)

Fringilla macroura Pallas, in Vroeg's Catal., 1764, Adumbrat., p. 3, "East Indies"; error; should be Africa.

Three males and one female, Kwamouth, 13 December 1926.

One female, Bumba, 30 December 1926.

One male, Kamaniola, 1 February 1927.

The male from Kamaniola is in full breeding plumage except that the long, innermost secondary is brownish. The female from Bumba is exceptionally small as compared with the one from Kwamouth and with a long series in the Museum of Comparative Zoölogy, having a wing length of only 51 as against 63.5 mm., tail 40 as against 53 mm., culmen from base of 8 as against 8.5 mm. in the Kwamouth bird.

Both females and males in non-breeding plumage vary in the width of the black head stripes. In some, the two stripes meet just before the base of the maxilla forming a narrow black forehead while others have a median V of brown coming down to the very base of the maxilla.

The three males from Kwamouth are in the early stages of the prenuptial molt.

Coliuspasser concolor concolor (Cassin)

Vidua concolor Cassin, Proc. Phil. Acad., 1848, p. 66: Sierra Leone.

Male, Nya Gezi, 3 February 1927.

This specimen is in fresh breeding plumage. The long rectrices are little more than half grown (138 mm. long) and the remiges, their greater and middle coverts, and especially the under tail-coverts are conspicuously margined with light pale buff. A male from Tandala, Tanganyika Territory,[1] (M.C.Z. 65347) has a slight reddish brown throat collar, approaching in this respect *Coliuspasser concolor ardens*, but much darker and less well defined. In this connection it is interesting to note that Reichenow (Vögel Afrikas, iii, 1904, p. 135) notes that specimens from Tandala (of which the M.C.Z. bird is one, received in exchange from the Berlin Museum) have this character. He does not say how many specimens he had from Tandala, but it is unlikely that he would have exchanged the only one with a reddish collar, and the only likely interpretation of his words is that his series of Tandala birds have this character. In a series of four breeding males from Liberia there is no trace of this collar. In view of the fact that *concolor* and *ardens* are so closely related it is decidedly interesting to find an intergrade in which the collar has remained in a likewise intermediate stage.

C. c. concolor is chiefly a West African bird ranging eastward to Lake Nyasa and Lake Albert, while *C. c. ardens* is a bird of southern and eastern Africa. This intermediate bird comes from near the easternmost limit of the range of *concolor* and the western edge of that of *ardens*. Schuster (Journ. f. Orn., 1926, pp. 725–726) writes that in the high grasslands of Uhehe near Iringa, he found both *C. concolor* and *C. ardens* together in swarms, and that hybrids occur as might be expected when birds live in flocks. However, he states definitely that *C. ardens* assumes nuptial plumage before *C. concolor*, which would indicate a possible differential breeding time. I am, therefore, not wholly convinced that the Tandala birds are hybrids and not erythristic phases. Shelley (Birds of Africa, iv, p. 44) definitely considered them hybrids. Bannerman (Rev. Zool. Afr., vii, 1920, p. 286) in commenting on Ogilvie-Grant's opinion (Trans. Zool.

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[1] Tandala is due north of the northern end of Lake Nyasa, between the lake and the southwestern tip of the Uhehe country.

Soc. Lond., 1910, p. 289) that *concolor* and *ardens* were merely color phases of one species, notes that of eleven adult males and five not fully adult taken at Poko, Uelle district, Belgian Congo, not one has the least indication of a red collar. He then raises the question, ". . . . Can all the birds be melanistic? And if so, how is it that no specimens of the red-collared whydah were obtained in this locality?" There can no longer be any doubt as to the genetic distinctness of these two birds, but probably both races are subject to a considerable variation and to some intergradation as well.

Urobrachya axillaris media Sharpe

Urobrachya axillaris media Sharpe, Ibis, 1902, p. 118: Tarangola, western Angola.

Male, Luvungi, 31 January 1927.

A male in full breeding plumage. It agrees with a series from western Uganda.

Pyromelana hordeacea sylvatica Neumann

Pyromelana flammiceps sylvatica Neumann, Jour. f. Orn., 1905, p. 345: Jaunde, Cameroon.

Male and female, Mistandungu, 15 December 1926.

This male, in breeding plumage, is darker and more reddish on the back than a specimen from the type locality, — Jaunde, Cameroon, and has a slightly stouter, more conical bill. The name *sylvatica* is an unfortunate one as the bird never occurs in forested areas. Bannerman (Rev. Zool. Afr. ix, 1921, p. 291) seems to have overlooked this form.

Pyromelana orix nigrifrons Böhm

Pyromelana nigrifrons Böhm, Journ. f. Ornith., 1884, p. 177: Karema, east shore Lake Tanganyika.

Male, Kamaniola, 1 February 1927.

Reichenow described *P. leuconota* from Ischangi, Lake Kivu, as being paler on the back and darker and more scarlet on the head and throat. Unfortunately the Kamaniola male is just coming into nuptial plumage, making comparisons impossible. However, Gyldenstolpe (Kungl. Sv. Vet. Akad. Handlngr., 1924, p. 46) examined birds to test the validity of this race and concluded that *leuconota* must be considered a synonym of *nigrifrons*. On the other hand van Someren (Nov. Zool. xxix, 1922, p. 148) writes that Reichenow unfortunately used, ". . . . as typical birds specimens with very pale straw colored backs. It has been proved beyond doubt that these pale-backed birds are old males that have come through the nesting season and are consequently faded, while fresh plumaged males have the back reddish brown. The crown and breast-band in this race is a deep red, not orange-red. . ." The series examined by me bear out Gyldenstolpe's conclusions, and I therefore synonymize *leuconota* with *nigrifrons*.

Pyromelana afra afra (Gmelin)

Loxia afra Gmelin, Syst. Nat. ii, p. 857, 1788: Africa.

Female, Bumba, 3 January 1927.

This specimen is similar to another female of *afra* in the Museum of Comparative Zoölogy, but is darker, particularly on the top of the head, which is almost solid black. The breast and throat are abundantly streaked with black, but unlike the other bird, the flanks are unstreaked, and the broad superciliary stripes are light buffy whitish. The specimen is in fresh plumage. Measurements are as follows: wing 52.5; tail 28.5; culmen, from the base 11.5 mm.

Pyrenestes ostrinus rothshildi Neumann

Pyrenestes ostrinus rothshildi Neumann, Journ. f. Orn., 1910, p. 528: Warri, S. Nigeria.

Juvenile male, Budja-lia, 26 December 1926.

This specimen is in the brownish plumage of immaturity with reddish only on the tail and upper tail-coverts. There is a slight indication of red on the sides of the upper throat. In identifying this bird to subspecies I follow Chapin (Bull. Am. Mus. Nat. Hist., 1924, pp. 415–441) as it is obviously impossible to tell races from immature birds. The measurements of the specimen are: wing 57; tail 45; culmen, from base 10.5 mm. Measuring the bill in the manner indicated by Chapin (*loc. cit.*, p. 418) I find the width of the mandible to be 11.5 and the bill from the nostril to be 8.0 mm.

Quelea sanguinirostris sanguinirostris (Linné)

Loxia sanguinirostris Linné, Syst. Nat., 10th ed., 1758, p. 173: Senegal.

Female, Lulenga, 2 March 1927.

This specimen is slightly darker than a female from Butiaba, Lake Albert, Uganda (type locality of *Q. s. centralis* van Someren), and has a somewhat smaller bill. On examining birds from western and central Africa I find that the characters given by van Someren for *centralis* (Bull. Brit. Orn. Cl., xli, 1921, p. 122) hold fairly well. The present bird is intermediate in coloration between typical *sanguinirostris* and *centralis*.

Spermestes poensis stigmatophorus Reichenow

Spermestes stigmatophorus Reichenow, Orn. Ges., iv, 1891, p. 4: Bukoba, west of Victoria Nyanza.

Male, Bumba, 1 January 1927.

Agrees with others from southwestern Uganda (Lake Mutanda) and the Ituri district, Belgian Congo (Medje), in the Museum of Comparative Zoölogy.

Lagonosticta senegella ruberrima Reichenow

Lagonosticta brunneiceps ruberrima Reichenow, Orn. Monatsb., 1903, p. 24: n. of Victoria Nyanza.

Two males, Uvira, 26 January 1927.

One of these birds has the white spots on the breast well developed and the other lacks them entirely. The former was approaching breeding condition when collected (testes somewhat enlarged) and the latter was not (testes small). The former has the under tail-coverts tipped with grayish white.

Estrilda astrild nyansae Neumann

Estrilda astrild nyansae Neumann, Journ. f. Orn., 1907, p. 596: Bukoba, w. of Victoria Nyanza.

Female (?) Kibati, 28 March 1927.

Although the original label of this specimen reads "Female?", the collector writes "ovary very slightly developed." The bird agrees with a series in the Museum of Comparative Zoölogy.

Estrilda melpoda melpoda (Vieillot)

Fringilla melpoda Vieillot, Nouv. Dict. xii, 1817, p. 177: Senegambia.

Male, Mistandungu, 15 December 1926.

This bird is lighter below than a male from Metet, Cameroon, with which it otherwise agrees.

Estrilda nonnula Hartlaub

Astrilda nonnula Hartlaub, Journ. f. Orn., 1883, p. 435: Kudurma, Bahr-el-Ghazal.

Male, Bumba, 30 December 1926.

This specimen agrees with typical *nonnula* in the Museum of Comparative Zoölogy. Reichenow's race *tenerrima* is probably not valid as the characters used (pale lead-gray under tail-coverts and entire underparts tinged with gray) seem very variable. This race (*tenerrima*) is said to inhabit the central Belgian Congo. The present specimen comes from the north central Congo and should be *tenerrima*, but it is lighter than birds from Tanganyika Territory, Kenya Colony, and Uganda.

Otyphantes stuhlmanni stuhlmanni (Reichenow)

Symplectes stuhlmanni Reichenow, Orn. Monatsb., 1893, p. 29: Wallia, w. of Lake Edward.

Two females, juvenile, Lulenga, 1 March and 4 March 1927.

These two immature birds were identified in the field by Dr. James P. Chapin. As I have no pertinent comparative material, I place them under this name on the strength of his identification, with the conviction that he is correct as usual. In the general coloration of the body, wings, and tail, they agree with a male from Mengo, Uganda. However, the heads have no black but are bright olive green like the back, this difference being due to sex and age. The entire underparts are rich yellow. The bills, as in all young birds, are much shorter than in adults, and are brownish, not black.

The bird collected on 1 March could not have been out of the nest more than a week. The rectrices and remiges are still basally enclosed in their sheaths. The other bird is older and has all the feathers full grown. Both are in fresh juvenal plumage.

Hyphanturgus nigricollis vacillans (van Someren)

Heteryphantes nigricollis vacillans van Someren, Bull. Brit. Orn. Cl., xli, 1921, p. 123: Budongo forest, Uganda.

Male, Yalembe, 7 January 1927.

H. n. vacillans is a good race, and may be told from typical *nigricollis* by its somewhat darker, blacker back. *H. n. melanoxanthus* of the coastal districts of Kenya Colony is still darker, and has a more slender bill.

Hyphanturgus aurantius aurantius (Vieillot)

Malimbus aurantius Vieillot, Ois. Chant., 1805, p. 73: Congo.

Male, Bumba, 30 December 1926.

The single specimen collected is a male in breeding condition. It agrees with another from Cameroon, and differs from specimens of *H. aurantius rex*, which is a good race in my opinion. I have seen examples of the latter form from Damba Islands, Sesse, Uganda.

Melanopteryx nigerrimus (Vieillot)

Ploceus nigerrimus Vieillot, Nouv. Dict., xxxiv, 1819, p. 130: Congo.

Male, Bumba, 3 January 1927.

The bird, in breeding condition (testes large) when shot, is in fresh nuptial plumage but has brownish feet. Yet it is not *maxwelli*, but *nigerrimus*. It has the stout bill of *nigerrimus*, not the more slender form of *maxwelli*.

Melanopteryx holomelas Sassi, is probably the same as *maxwelli*, and should be considered as a synonym of the latter.

Textor cucullatus bohndorffi (Reichenow)

Ploceus bohndorffi Reichenow, Journ. f. Orn., 1887, pp. 214, 307: Stanley Falls, central Belgian Congo.

Female, Lulenga, 4 March 1927.

I provisionally place this specimen (which was identified as such in the field by Dr. James P. Chapin) in this subspecies. I have no *bohndorffi* material to compare with it, but it is quite different from a female of *T. c. femininus* Ogilvie-Grant from Gyassa, Uganda (M.C.Z. 97385). It has no buffy on the breast, flanks, sides, abdomen, and under tail-coverts, and also differs from *femininus* in having a smaller bill (culmen 17.5 as against 20.0 in *femininus*).

Brachycope anomala (Reichenow)

Ploceus anomalus Reichenow, Journ. f. Orn., 1887, p. 214: Stanley Falls.

Male, Budjalibala, 25 December 1926.

Male, Bumba, 1 January 1927.

The male from Budjalibala is in non-breeding plumage while that from Bumba is in prenuptial molt. In the latter the black cheeks, chin, and throat are somewhat indicated and the yellow breast and crown are becoming distinct. There is no trace, however, of the black spots on the sides that come later. The bill of the Budjalibala bird is brownish while that of the Bumba bird is black as in an adult in breeding plumage from Avakubi (J. P. Chapin coll., M.C.Z. 96417), Ituri district.

Judging by Schouteden's notes on the distribution of this rather uncommon bird (Rev. Zool. Afr., x, no. i, 1922, pp. 72–75), Bumba and Budjalibala are new localities for this species.

After this paper was written it was rapidly glanced over by Dr. James P. Chapin, who made some changes and valuable suggestions for which I am much indebted to him. However, he did not see the birds when going over the present manuscript. Dr. Chapin met part of the Harvard Expedition in the eastern Congo and wrote field identifications on the labels of some of the birds. These have saved considerable time in the final study of the collection.

XXXV

REPTILES AND AMPHIBIANS FROM LIBERIA

By T. Barbour and A. Loveridge

There is probably no easily accessible region in all Africa which has received so little attention from herpetologists as Liberia. The paucity of literature on the reptile fauna of this area is well illustrated by the bibliography which is attached to the present paper. In 1921 Chabanaud reported on thirteen species of amphibia which he collected at Sanikole in the north-east of the country. Until then there were about six species known from Liberia.

Dr. Glover Allen and his associates of the Harvard African Expedition of 1927, under the leadership of Professor R. P. Strong, have more than doubled the number of recorded amphibia, for they secured thirty-three species. They are also to be congratulated on the remarkably fine reptilian collection representing forty-one species many of which are recorded from Liberia for the first time.

The most interesting novelty is a strange *Xenopus*-like *Rana* which, in a preliminary description published in the Proceedings of the New England Zoological Club of 1927, we referred to a new genus *Pseudoxenopus*. Dr. Noble, however, has pointed out that the characters on which this was founded are those of juvenile *Rana* where ossification of cartilaginous parts of the girdle takes place in later life. The species *alleni*, while distinct from *Rana occipitalis*, is undoubtedly closely related to that species.

The following species were described from the collection.

Rana alleni sp. n.
Phrynobatrachus liberiensis sp. n.
Cardioglossa decorata sp. n.
Cardioglossa liberiensis sp. n.
Hyperolius festivus sp. n.
Lygodactylus strongi sp. n.

Of the thirty-three species recorded from Liberia for the first time most noteworthy are the series of *Riopa dura* (Cope) which is very rare in collections. It is also of interest to know that the arboreal cobra — *Naja goldii* — occurs here. Dr. Allen got no fewer than six species of *Arthroleptis,* a genus hitherto unrecorded from Liberia. Doubtless Chabanaud's records of *Phrynobatrachus natalensis,* and its synonym *P. boulengeri* from Sanikole, are identical with one or another of the five species collected by Dr. Allen. The genus is badly in need of revision as so many of its species apparently show considerable variation.

Dr. Allen's very interesting field notes are well worthy of quotation.

To render the present paper more useful we have appended a list of all other reptiles and amphibians known to occur in Liberia, though not obtained by the Harvard Expedition.

CROCODYLIDAE

Crocodylus cataphractus Cuvier

1 skull (M.C.Z. 22483) Totokwelli. 29. x. 26.

"One crocodile measuring 2½ metres in length was shot by Dr. Bouet in the Du River. It was carrying leeches on the back near the base of the tail, and the blood contained haemogregarines."

Osteolaemus tetraspis Cope

Skin and skeleton (M.C.Z. 22913–4) Paiata, St. Paul's River.

1043 mm. in total length. There were some leeches on its skin.

TESTUDINIDAE

Kinixys homeana (Bell)

2 ex. (M.C.Z. 22487 and 24010) Lenga Town, Farmington River.

An adult and one young. Recorded for the first time from Liberia, though this country is within the range of the species, which is coterminous with that of *K. erosa.*

Kinixys erosa (Schweigger)

2 ex. (M.C.Z. 22484–5) Bonuta.

1 ex. (M.C.Z. 22486) Lenga Town, Farmington River.

2 ex. (M.C.Z. 22488) Paiata, St. Paul's River.

Büttikofer records a Dentated Hinged Tortoise 25 cm. in length and says that it is moderately common in both forest and bush country.

TRIONYCHIDAE

Amyda triunguis (Forskal)

1 ex. (M.C.Z. 22489) St. John's River near Gbanga.

A soft-shelled Water Tortoise weighing 75 lbs. is referred to by Büttikofer. He gives its total length as 122 cm. The shield, however, measured only 78 × 57 cm. Büttikofer found but two such giant specimens, most of them being, like ours, about the "size of one's hand." The big turtles had their stomachs full of oil nuts and the observer declares that he believes that these supposedly strictly aquatic creatures came ashore at night and wandered afield foraging for fruits. This observation, if accurate, is most peculiar, indeed unique.

TYPHLOPIDAE

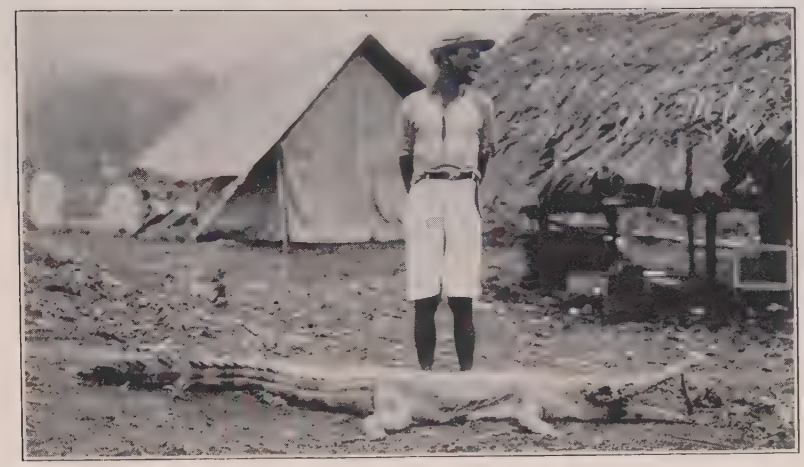
Typhlops punctatus Leach

2 ex. (M.C.Z. 22490–1) Bakratown.

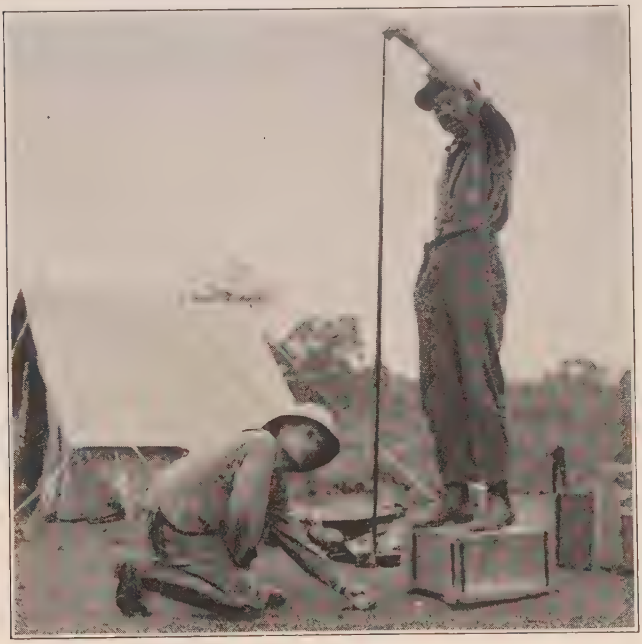
5 ex. (M.C.Z. 22492–6) Gbanga.

Typhlops liberiensis Jan and *krausii* Jan have long been recognized as synonyms.

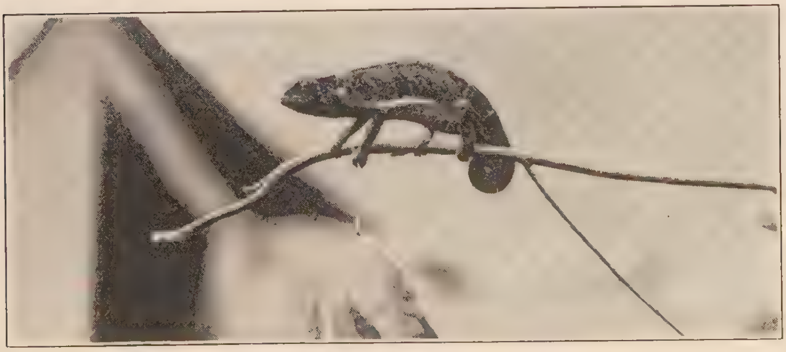
"One of the young Bakratown specimens was found crawling hurriedly along at noonday with a slight caterpillar-like undulation, not a horizontal motion.



No. 462. — Crocodile, *Crocodylus cataphractus* Cuvier



No. 463. — *Dendraspis viridis* (Hallowell), 7 ft. 5 in. in length



No. 464. — *Chamaeleon gracilis* Hallowell

The other was brought into camp in a log of wood. On the latter being split open the snake, together with a lot of ants, fell out." "One of the Gbanga snakes measuring two feet three inches was full of adult black ants and their larvae."

PYTHONIDAE

Python sebae (Gmelin)

1 ex. (M.C.Z. 22497) Paiata, St. Paul's River.
1 ex. (M.C.Z. 22498) Plantation No. 3, Du River.
2 ex. (M.C.Z. 22499–500) Near Monrovia.

"Natives say that the young pythons eat fish. One was found to have swallowed a roof rat."

Calabaria reinhardtii (Schlegel)

1 (M.C.Z. 22501) Paiata, St. Paul's River.

This interesting burrowing python was first described from the Gold Coast and is now known to range throughout the rain forest. "When brought to us it remained tightly coiled in a knot."

COLUBRIDAE

Natrix fuliginoides (Günther)

3 ex. (M.C.Z. 22502–4) Paiata, St. Paul's River.

Natrix ferox Günther

5 ex. (M.C.Z. 22504–8) Paiata, St. Paul's River.

Lycophidion fasciatum (Günther)

1 ex. (M.C.Z. 22610) Paiata, St. Paul's River.

Hormonotus modestus (Duméril and Bibron)

1 ex. (M.C.Z. 22510) Plantation No. 3, Du River.

Chlorophis irregularis (Leach)

2 ex. (M.C.Z. 22511–2) Gbanga.

Both agree with Boulenger's latest definitions of *heterolepidotus* in that the praeoculars are widely separated from the frontal. The larger specimen has only 1 + 1 temporals, the smaller 1 + 2. The scale counts, viz. ventrals 160–171, subcaudals 107–112, make it necessary to refer these snakes to *irregularis*.

Philothamnus nitidus (Günther)

4 ex. (M.C.Z. 22514) Gbanga.

Gastropyxis smaragdina (Schlegel)

1 ex. (M.C.Z. 22513) Gbanga.
2 ex. (M.C.Z. 22515–6) Plantation No. 3, Du River.

Hapsidophrys lineata Fischer

1 ex. (M.C.Z. 22518) Paiata, St. Paul's River.

Grayia smithii (Leach)

1 ex. (M.C.Z. 22517) Plantation No. 3, Du River.

DASYPELTIDAE

Dasypeltis scaber (Linné)

1 ex. (M.C.Z. 22519) Banga.

DIPSADOMORPHIDAE

Crotaphopeltis hotamboeia hotamboeia (Laurenti)

1 ex. (M.C.Z. 22520) Liberia.

Boiga blandingii (Hallow)

1 ex. (M.C.Z. 22521) Paiata, St. Paul's River.

Psammophis sibilans (Linné)

1 ex. (M.C.Z. 22522) Plantation No. 3, Du River.

Thelotornis kirtlandii (Hallow)

1 ex. (M.C.Z. 22523) Gbanga.

Miodon acanthias (Reinhardt)

1 ex. (M.C.Z. 22524) Gbanga.
1 ex. (M.C.Z. 22525) Nickabo.
3 ex. (M.C.Z. 22526–8) Paiata, St. Paul's River.
2 ex. (M.C.Z. 22529–30) Plantation No. 3, Du River.

Color in life: "Above longitudinal black lines with Brazil red stripes between. Belly bitter-sweet orange."

ELAPIDAE

Naja goldii Boulenger

1 ex. (M.C.Z. 22531) Totokwelli.

This cobra undoubtedly ejects its venom to a distance like *Naja haje, N. nigricollis,* etc. The junior author has seen them doing so in the New York Zoological Park.

Naja melanoleuca Hallowell

1 ex. (M.C.Z. 22532) North of Moala.

It is interesting to find that the Black-lipped Cobra is arboreal on the West Coast. In the savannah country near Lake Victoria it is associated with termite hills in which it dwells.

"We were sitting down to lunch in the forest when the porters saw something white move at the mouth of a hole some fifty feet up in one of the forest trees.

I fired at it but it disappeared. Two natives, carrying axes in their teeth, clambered up and cut off the limb but the reptile retreated to the proximal end. On chopping this open the creature was dispatched and before skinning was found to measure 2430 mm." (just under 8 feet).

Dendraspis viridis (Hallowell)

1 ex. (M.C.Z. 22533) Gbanga.
1 ex. (M.C.Z. 22534) Paiata, St. Paul's River.
1 ex. (M.C.Z. 22535) Plantation No. 3, Du River.

"One of these snakes crawled beneath the ground-sheet of Dr. Shattuck's tent and we slowly pulled it out by the tail. It measured six feet eight and a half inches." "The blood contained numerous free-swimming forms of a haemogregarine." "The Gbanga specimen was seven feet and five inches in length."

VIPERIDAE

Causus rhombeatus (Lichtenstein)

1 ex. (M.C. Z. 22538) Medina.
1 ex. (M.C.Z. 22539) Paiata, St. Paul's River.
9 ex. (M.C.Z. 22540–4) Plantation No. 3, Du River.
3 ex. (M.C.Z. 22545–7) Gbanga.
1 ex. (M.C.Z. 24009) Monrovia.

Venomous snakes would appear to occur in greater numbers in Liberia than on the East Coast. Of the total number of species now known from Liberia, one in three are poisonous. Of the seventy specimens brought back by the Harvard Expedition thirty are dangerously venomous. "Two of these snakes were examined, one had eaten a toad, the other a frog. Of parasites there were filariids in the general cavity, lingatulids in the lung."

Causus lichtensteini (Jan)

1 ex. (M.C.Z. 22536) Du River Plantation, No. 3.
1 ex. (M.C.Z. 22537) North of Moala.

Color in life of Du River snake "Back burnt sienna with dark V-shaped marks. Belly grayish white." The Moala snake is recorded as being "A bright golden brown with very small black chevrons on the back. Border of upper lip light yellow. Belly white with pearly iridescent reflections."

Bitis gabonica (Duméril and Bibron)

1 ex. (M.C.Z. 22548) Paiata, St. Paul's River.
1 ex. (M.C.Z. 22549) Lenga Town.

Bitis nasicornis (Shaw)

1 ex. (M.C.Z. 22550) Paiata, St. Paul's River.

Büttikofer's colored plate of *B. rhinoceros* (which is a synonym of *B. nasicornis*) represents a composite animal for it has the internasal horn-like processes of *B. nasicornis* and the coloring of *B. gabonica*. The very characteristic arrow-like marking on the head of *B. nasicornis* is completely absent. "At Memmeh Town another specimen was found which contained a number of lingatulids in the wind-pipe and lung-sac. The local name of this snake is Kissadi."

Atheris chlorechis (Schlegel)

2 ex. (M.C.Z. 22551–2) Gbanga.
1 ex. (M.C.Z. 22553) Bonuta.
1 ex. (M.C.Z. 22554) Plantation No. 3, Du River.
2 ex. (M.C.Z. 22555–6) Paiata, St. Paul's River.

"These snakes remain perfectly still in low vines or bushes and allow one to approach quite close. One was seen coiled up in a bush about four feet from the ground. I struck it a powerful blow with a stick thinking to break its back, but for several minutes could not again find it, though the ground was open and nearly bare. At length it dawned on my sight posed in stiff and motionless attitude among a few spears of grass which it exactly matched in color. It had lately swallowed a multimammate mouse.

Another I nearly brushed against while searching for a bird I had shot in a thicket. The snake stayed motionless in a green vine about five feet from the ground until a native shot it through with a palm-rib arrow. On another occasion Coolidge killed one coiled up on the ground at the foot of a forest tree; in its stomach was a *Crocidura*."

GECKONIDAE

Hemidactylus mabouia (Moreau de Jonnes)

11 ex. (M.C.Z. 2570–5) Monrovia.

This is the common House Gecko of tropical Africa which is beneficial in keeping down the abundant insect life.

Hemidactylus muriceus Peters

1 ex. (M.C.Z. 22576) Paiata, St. Paul's River.

"This specimen was taken in the forest far from any native hut."

Hemidactylus fasciatus Gray

1 ex. (M.C.Z. 22569) Gbanga.

Lygodactylus strongi Barbour and Loveridge.

Lygodactylus strongi Barbour and Loveridge, 1927, Proc. New Engl. Zool. Club, x, p. 18.

Type (only example), no. 22578, Museum of Comparative Zoology, immature female (?), from Firestone Plantation, Du River, Liberia, collected by G. M. Allen, July, 1926.

Apparently related to *L. conraui* Tornier from Cameroons, with which it agrees in having transversely enlarged subcaudals; This immediately distinguishes it from *L. fischeri* Boulenger, from Sierra Leone. Diagnostic characters are: snout twice the orbital diameter; nostril between five scales or plates; large size of mental; enlarged subcaudals.

Description. — Head oviform, much longer than broad; snout twice the diameter of the eye, longer than the distance between the eye and the ear-opening; ear-opening very small, roundish. Rostral broad; nostril pierced above and behind the suture of the rostral and first labial, between rostral, first labial, two small scales and an enlarged supranasal; two scales between enlarged supranasals; seven upper labials; six lower labials; mental large, subtriangular not extending beyond the

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posterior of the adjacent shields, bounded posteriorly by three granular scales. Scales of upper surface small, granular, larger on the snout; abdominal scales large, imbricate, smooth. Digits very unequal, free, fourth longest, first rudimentary; four and five pairs of lamellae under the other digits; praeanal pores. Tail tapering, rounded, flattened below, covered above with small juxtaposed scales, below with very big, transversely enlarged subcaudals except near tip where they are paired to form the sucking apparatus characteristic of the genus.

Coloration. — Above pale brown, freely mottled with darker brown; hind limbs and body near base of tail sprinkled with white; tail with a few pale fawn-colored streaks. Beneath immaculate pure white.

Measurements. — Length of head and body, 24; tail, 27; head, 6; hind limb, 11 mm.

AGAMIDAE

Agama agama agama Linné

1 ex. (M.C.Z. 22562) Monrovia.
3 ex. (M.C.Z. 22563–4) Gbanga.
7 ex. (M.C.Z. 22565–6) Du River.

The handsomely colored tree or rock lizard has long been known from Liberia and Johnston has an excellent colored plate of it in his work.

VARANIDAE

Varanus niloticus (Linné)

1 ex. (M.C.Z. 22567) Lenga Town, Farmington River.
1 ex. (M.C.Z. 22568) Gbanga.

The Nilotic Monitor is a well-known pest to the natives whose chickens and eggs it steals.

LACERTIDAE

Lacerta echinata Cope

1 ex. (M.C.Z. 22579) Plantation No. 3, Du River.

This peculiar arboreal lizard was new to the Museum of Comparative Zoology and is rare in collections.

"Brought in by the tree-cutters."

SCINCIDAE

Mabuya raddoni (Gray)

1 ex. (M.C.Z. 22589) Gbanga.
2 ex. (M.C.Z. 22590–1) Paiata, St. Paul's River.
10 ex. (M.C.Z. 22592–22601) Plantation No. 3, Du River.

Mabuya bensonii (Peters)

1 ex. (M.C.Z. 22580) Bonuta.
3 ex. (M.C.Z. 22581–3) Monrovia.
6 ex. (M.C.Z. 22584–8) Gbanga.

"While pursuing some of these among some black rocks by a small brook near Monrovia, we heard a hollow, faint quacking noise — *quek, quek,* two or three times repeated, apparently by these lizards."

Riopa durum (Cope)

1 ex. (M.C.Z. 22602) Plantation No. 3, Du River.
1 ex. (M.C.Z. 22603) Paiata, St. Paul's River.
1 ex. (M.C.Z. 22604) North of Moala.
4 ex. (M.C.Z. 22605–8) Gbanga.

"Semiaquatic. The first one taken was seen by Bequaert sunning on a fallen tree over a brook, into which it dropped on being disturbed, but he caught it with his net. Later we caught a number along the edges of shallow brooks in the forest. They would walk along the shallow bottom near the shore with their heads out of water, but on being frightened, scrambled out and tried to escape on land."

Riopa fernandi (Burton)

1 ex. (M.C.Z. 22609) Plantation No. 3, Du River.

CHAMAELEONTIDAE

Chamaeleon gracilis Hallowell

1 ex. (M.C.Z. 22557) Lenga Town, Farmington River.
4 ex. (M.C.Z. 22558–61) Plantation No. 3, Du River.

"These chameleons are not abundant and the natives are much afraid of them. On August 4th one was brought in and placed in a box overnight, by the next afternoon it had laid thirty oval white eggs."

CAECILIIDAE

Geotrypetes seraphini (A. Duméril)

1 ex. (M.C.Z. 13063) Gbanga.

This was taken by Bequaert from a *Miodon acanthias* which was holding it about mid-body, with the evident intention of making a meal of the caecilian.

PIPIDAE

Xenopus tropicalis (Gray)

1 ex. (M.C.Z. 11861) Gbanga.
4 ex. (M.C.Z. 11862–5) Plantation No. 3, Du River.
26 ex. (M.C.Z. 11866–11871) Paiata, St. Paul's River.

BUFONIDAE

Bufo regularis regularis Reuss

1 ex. (M.C.Z. 11872) 15 miles up Du River.
1 ex. (M.C.Z. 11873) Lenga Town, Farmington River.
1 ex. (M.C.Z. 11874) Moala.
5 ex. (M.C.Z. 11875–9) Paiata, St. Paul's River.
6 ex. (M.C.Z. 11880–5) Du River.
8 ex. (M.C.Z. 11886–90) Monrovia.
20 ex. (M.C.Z. 11891–5) Gbanga.

Bufo togoensis Ahl.

1 ex. (M.C.Z. 11983) Banga.

It is interesting to find this species, so recently described from Togoland, occurring in Liberia. "In the forest by a brook."

BREVICIPITIDAE

Hemisus marmoratus (Peters)

1 ex. (M.C.Z. 11896) Bonuta.

RANIDAE

Rana albolabris Hallowell

1 ex. (M.C.Z. 11897) Bonuta.
1 ex. (M.C.Z. 11898) Paiata, St. Paul's River.
5 ex. (M.C.Z. 11899–11903) Plantation No. 3, Du River.
30 ex. (M.C.Z. 11904–10) Gbanga.

Rana bibronii Hallowell

1 ex. (M.C.Z. 11921) Paiata, St. Paul's River.
5 ex. (M.C.Z. 11922–6) Monrovia.
5 ex. (M.C.Z. 11927–31) Plantation No. 3, Du River.
6 ex. (M.C.Z. 11932–6) Gbanga.

Rana occipitalis Günther

Ranasoma schereri Ahl, 1924, Archiv für Naturg., Berlin, pp. 250–251.
Rana mwanzae Loveridge, 1925, Proc. Zool. Soc., London, pp. 772–774, Pl. II.

1 ex. (M.C.Z. 11937) Gbanga.
1 ex. (M.C.Z. 11938) Monrovia.
3 ex. (M.C.Z. 11939–41) Paiata, St. Paul's River.

Dr. G. K. Noble, who has examined the type of *R. schereri* in Berlin, informs us that it is a synonym of *Rana occipitalis* with which species, indeed, the author compares it. We now add to the synonymy *Rana mwanzae* from near Lake Victoria. The creation of this species is in part due to the somewhat incomplete and faulty original description of *R. occipitalis*. The types of *mwanzae* are enormous individuals.

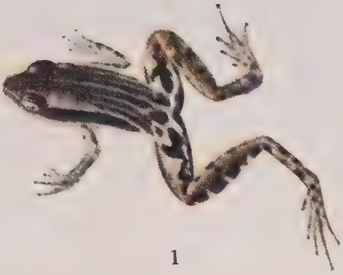
Rana alleni (Barbour and Loveridge)

Pseudoxenopus alleni Barbour and Loveridge, 1927, Proc. New Engl. Zoöl. Club, x, p. 14.

Type (only example), no. 11,991, Museum of Comparative Zoölogy, male, from Firestone Plantation No. 3, Du River, collected by G. M. Allen, July 19, 1926.

Description. — Head rather short and broad, tympanum hidden, eyes rather dorso-lateral, a conspicuous groove running from posterior border of eye to insertion of hind limb. Body strongly depressed, rather Xenopus-like; fingers long, slender and poorly developed, four in number, of equal length, with sharp apices, probably tactile, also very Xenopus-like; thighs and tibia expanded and depressed; feet large, completely webbed; toes long and slender; the tibio-tarsal articulation of the adpressed hind limb reaches the posterior border of the eye.

Skin conspicuously warty on all dorsal surfaces, warts subequal and best developed over dorsal



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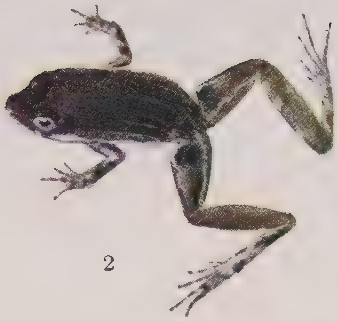

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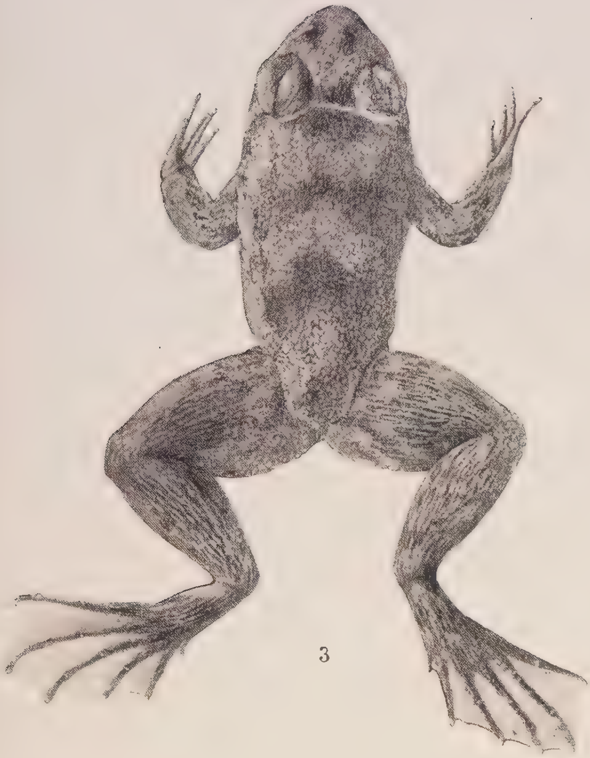

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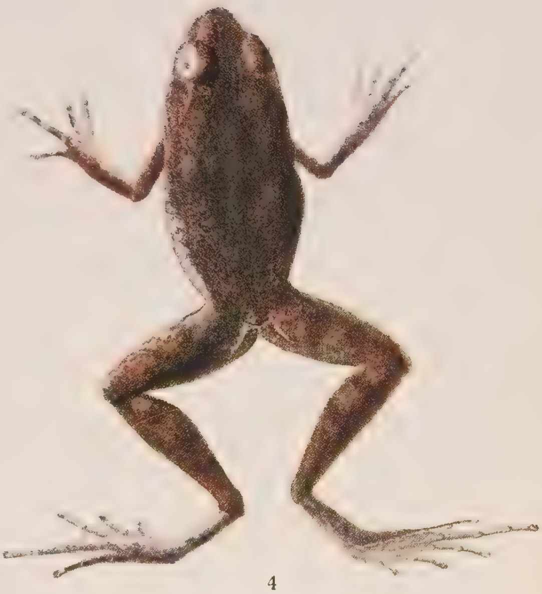

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No. 464 (Figs. 1–4). — New Ranoid Frogs from Liberia. Nos. 1, 2, 4, twice natural size; No. 3, three times natural size

Fig. 1. — *Cardioglossa decorata* sp. n. Type. (MCZ No. 12032)
Fig. 2. — *Cardioglossa liberiensis* sp. n. Type. (MCZ No. 12034)
Fig. 3. — *Rana alleni* sp. n. Type. (MCZ No. 11991)
Fig. 4. — *Phrynobatrachus liberiensis* sp. n. Type. (MCZ No. 11993)

region, smaller on head and limbs. Belly smooth, with a faintly outlined discoidal fold; lower side of limbs smooth.

Coloration. — Above ashy gray, with five dark dorsal areas: the first on the nasal region, the second a band connecting the orbits, third a band across intertympanic region, fourth a fainter band across the back just posterior to the insertion of the fore limbs, fifth a curved marking across the sacral region. Fore and hind limbs mottled and irregularly cross-barred with dark gray on the light gray field. Below, all ventral surfaces immaculate white.

Measurements. — Snout to vent, 28; length of head, 10; breadth of head, 11; diameter of orbit, 2.5; length of tibia, 13; length of foot, 20; length of fourth toe, 11 mm.

We created the genus *Pseudoxenopus* chiefly on account of the absence of vomerine teeth in the type specimen *alleni*, this condition, however, is not altogether rare in juvenile examples of the genus *Rana* and we have arrived at the conclusion that the type is juvenile and not "probably adult" as we originally stated.

On comparing this type of *Rana alleni* with a *Rana occipitalis* of the same length, i.e. 28 mm. snout to vent, from Faradje, Belgian Congo (A.M.N.H. 10910) the following points of difference are clearly noticeable.

The snout of *alleni* is much shorter (4. 25 mm.) than that of *occipitalis* (5.5 mm.), its outline is much rounder and less acuminate in consequence.

The nostrils of *alleni* are much closer together (2 mm.) than in *occipitalis* (2.65 mm.), moreover they are not raised in the same way for they hardly break the contour of the head which in *occipitalis* has an angular appearance when viewed laterally.

While there is no apparent tympanum in *alleni* that organ is large and conspicuous in *occipitalis* with a diameter of 2.25 mm.

While there is a strongly pronounced transverse dermal fold meeting the posterior borders of the eyes in *alleni* as in adult *occipitalis*, in very juvenile *occipitalis* there is only a broad smooth depression.

Alleni has much stouter thighs the transverse measurement being 7.5 mm., while that of *occipitalis* is only 5.5 mm.

The dorsal derm of *alleni* presents a very different appearance to that of *occipitalis*, the subequal warts of the former give the back an almost granular appearance while the *very* unequal warts of *occipitalis* show a tendency to form series, almost ridges.

The coloration is different, strikingly so at first glance though on close inspection a definite resemblance is to be noted, the characteristic blotching of the upper lip in *occipitalis* is wanting in *alleni* though perhaps indicated.

In series, the length of the hind limb and the relative length of the fingers of *occipitalis* include *alleni* within their range of variation.

The above characters of the Faradje frog hold good for four specimens from Faradje, Garamba, and Stanleyville ranging in size from 24 to 31 mm., kindly lent by Dr. G. K. Noble, as also for the Liberian specimens brought back by Dr. Allen, that is to say they all consistently differ from *alleni* in these points.

Phrynobatrachus francisci Boulenger

1 ex. (M.C.Z. 11984) Suahkoko.

Phrynobatrachus giorgii De Witte

5 ex. (M.C.Z. 11946–50) Gbanga.
10 ex. (M.C.Z. 11951–60) Plantation No. 3, Du River.
10 ex. (M.C.Z. 11961–70) Paiata, St. Paul's River.

The series from Firestone Plantation exhibits a state of webbing of the hind toes from half to very fully webbed; those from Paiata are all fully webbed.

Phrynobatrachus perpalmatus Boulenger

6 ex. (M.C.Z. 11985–90) Plantation No. 3, Du River.

Phrynobatrachus steindachneri Nieden

1 ex. (M.C.Z. 11992) Paiata, St. Paul's River.

Phrynobatrachus liberiensis Barbour and Loveridge

Phrynobatrachus liberiensis Barbour and Loveridge, 1927, Proc. New Engl. Zoöl. Club, x, p. 14.

Type, no. 11993, Museum of Comparative Zoölogy, female, from Gbanga, Liberia, collected by G. M. Allen, October, 1926. Eight examples (M.C.Z. nos. 11993–11999), and one now in the British Museum, all from Gbanga.

Apparently related to *P. steindachneri* Nieden from Banjo, Cameroons. Differs from *P. steindachneri* in having an interorbital region narrower than the upper eyelid, absence of tarsal tubercle, less webbing on hind toes.

Description. — Habit moderately stout. Tongue with a conical papilla in the middle. Head as long as broad. Snout obtusely pointed, slightly projecting beyond the mouth; canthus rostralis rounded, loreal region slightly concave; nostril noticeably nearer to the end of the snout than to the eye; interorbital space slightly broader than the upper eyelid; a fold from the posterior border of the eye borders the tympanum and extends to the base of the fore limb; tympanum distinct, two thirds the diameter of the eye. Fingers well developed, first and second equal, fourth slightly longer, third very much longer than any of the others, hardly a rudiment of web. Toes moderate, about two thirds webbed except fourth toe which is but half webbed, tips of fingers and toes dilated almost into small discs, subarticular tubercles well developed, prominent, a well developed inner metatarsal tubercle from which proceeds a fold or groove posteriorly, a scarcely discernible outer metatarsal tubercle but no tarsal tubercle. The tibio-tarsal articulation reaches the eye (anterior or posterior border in adults, end of snout in juveniles). Skin above, finely granular (warty in some specimens); below, perfectly smooth.

Coloration. — Above, uniformly brown (or grayish brown) on head and back (in young specimens a brown band from the region of the axilla unites with its fellow in the middle of the back); a conspicuous vertical white stripe on nose; edge of upper jaw whitish (or mottled with white); a triangular patch surrounds the anal region, and is bordered on the upper sides by two white lines; some trace of bars upon the limbs (young distinctly barred). Below, white with brownish, white-blotched lower lips; a certain amount of brown mottling or stippling on throat, breast, and limbs, but belly immaculate.

Measurements. — Snout to vent, 33; length of head, 11; breadth of head, 11; diameter of orbit, 4; length of tibia, 19; length of foot, 25; length of fourth toe, 15 mm.

Phrynobatrachus ogoensis (Boulenger)

1 ex. (M.C.Z. 11981) Plantation No. 3, Du River.
3 ex. (M.C.Z. 12036–8) Gbanga.

Arthroleptis adolfi-friederici Nieden

1 ex. (M.C.Z. 11971) Bonuta.
2 ex. (M.C.Z. 11972–3) Gbanga.
1 ex. (M.C.Z. 11974) Moala.
1 ex. (M.C.Z. 11975) St. Paul's River.

Arthroleptis calcaratus (Peters)

1 ex. (M.C.Z. 11976) Gbanga.

Arthroleptis poecilonotus Peters

2 ex. (M.C.Z. 11977–8) Gbanga.
1 ex. (M.C.Z. 11979) Bonuta.

Arthroleptis taeniatus Boulenger

1 ex. (M.C.Z. 11980) Monrovia.

Arthroleptis werneri Nieden

1 ex. (M.C.Z. 11982) Plantation No. 3, Du River.
1 ex. (M.C.Z. 12033) Banga.

Hitherto only known from the type localities — Banjo District and Bamenda, Cameroons.

Cardioglossa decorata Barbour and Loveridge

Cardioglossa decorata, Barbour and Loveridge, 1927, Proc. New Engl. Zoöl. Club, x, p. 15.

Type, no. 12032, Museum of Comparative Zoölogy, male, from Banga, Liberia, collected by G. M. Allen, October, 1926. Five examples (M.C.Z., nos. 12027–12031), Gbanga, October, 1926; one (M.C.Z., no. 12032), Banga, October, 1926.

A rather small, stout-limbed species, without tympanum, rather narrow forehead, and extraordinary coloration.

Description. — Tongue rather large, cordate and deeply notched behind; nostril slightly nearer to tip of snout than to eye, its distance from the eye being less than half of the ocular diameter; eyes very large and prominent; upper eyelids almost equal in width to interorbital space; tympanum invisible; fingers moderately long, first shorter than second, which is slightly shorter than the fourth, the third longer than second by slightly more than one third the length of the latter; hind limbs rather short and thick, toes slender, unwebbed, the tibio-tarsal articulation of the adpressed hind limb reaches the eye. Skin of back with many inconspicuous flat glands; of all the surfaces smooth and shiny.

Coloration. — Back deep mauve with (or without) a fine midvertebral white line, a black spot on each side of the postsacral region; sides with a broad conspicuous black band from tip of snout to insertion of thigh, faintly bordered anteriorly and boldly bordered posteriorly by a narrow area of pale mauve; the dark lateral stripe narrows posteriorly, and its hinder end is surmounted by another dark elongate blotch; hinder aspect of thigh with a conspicuous white streak bordered by a wide dark stripe below, and by a dark stripe having an uncinate projection above, anterior aspect of thigh pale mauve with a conspicuous dark longitudinal stripe, arms and feet spotted. Throat dark slaty gray; other lower surfaces white, with scattered round dark dots, most abundant on the anterior portion of the belly.

Measurements. — Snout to vent, 19; length of head, 8.5; breadth of head, 7; diameter of orbit, 2.5; length of tibia, 11; length of foot, 16; length of fourth toe, 8 mm.

Cardioglossa liberiensis Barbour and Loveridge.

Cardioglossa liberiensis Barbour and Loveridge, 1927, Proc. New Engl. Zoöl. Club, x, p. 16.

Type (only example), no. 12034, Museum of Comparative Zoölogy, female, breeding, from Paiata and vicinity of St. Paul's River, Liberia, collected by G. M. Allen, October, 1926.

A slender, rather long-limbed, species, with tympanum barely distinguishable, and most peculiar coloration.

Description. — Tongue small, round; nostril much nearer to tip of snout than to eye; distance from eye to nostril equal to one half the ocular diameter, upper eyelids distinctly narrower than interorbital space; tympanum large, perhaps almost half diameter of eye, but very indistinct (much more distinct on one side than on the other); fingers slender, first and second equal, third twice the length of second, fourth slightly longer than second, tips scarcely dilated; hind limbs long and slender; toes without trace of web, very long and slender; the tibio-tarsal articulation of the adpressed hind limb reaches the nostril. Skin, above and below, smooth and glistening.

Coloration. — Above dark slate, almost black; posterior aspect of thigh with (in alcohol) a fine white line or series of elongate spots; on the anterior aspect of each thigh close to body, a white spot. Belly dark slate, with a coarse net work of anastomosing narrow white lines. Lower aspects of hind limbs white, abundantly spotted or blotched with dull brown; feet and hands banded or spotted with dark brown or white.

Measurements. — Snout to vent, 22; length of head, 6.5; breadth of head, 6.5; diameter of orbit, 3; length of tibia, 12; length of foot, 16; length of fourth toe, 9 mm.

Leptopelis tessmanni Nieden

2 ex. (M.C.Z. 12000–1) Gbanga.
2 ex. (M.C.Z. 12002–3) Plantation No. 3, Du River.

These specimens agree very closely with Nieden's description except in size, the largest of these being only 42 mm. and the smallest 12 mm. Probably all are immature. They are not, however, identical with *Leptopelis tessmanni* of Noble from the Congo. We have carefully examined two of his Medje specimens and find them identical with *L. aubryi* of which we have a large series from the Cameroons. Why Dr. Noble should consider the absence of a dorso-lateral line a character of *L. rufus* is difficult to say as most East African *L. rufus* have such a line and these were carefully compared with similar specimens in the British Museum.

Hylambates hyloides Boulenger

1 ex. (M.C.Z. 11942) Paiata, St. Paul's River.
1 ex. (M.C.Z. 11943) Moala.
1 ex. (M.C.Z. 11944) Gbanga.

Megalixalus immaculatus Boulenger

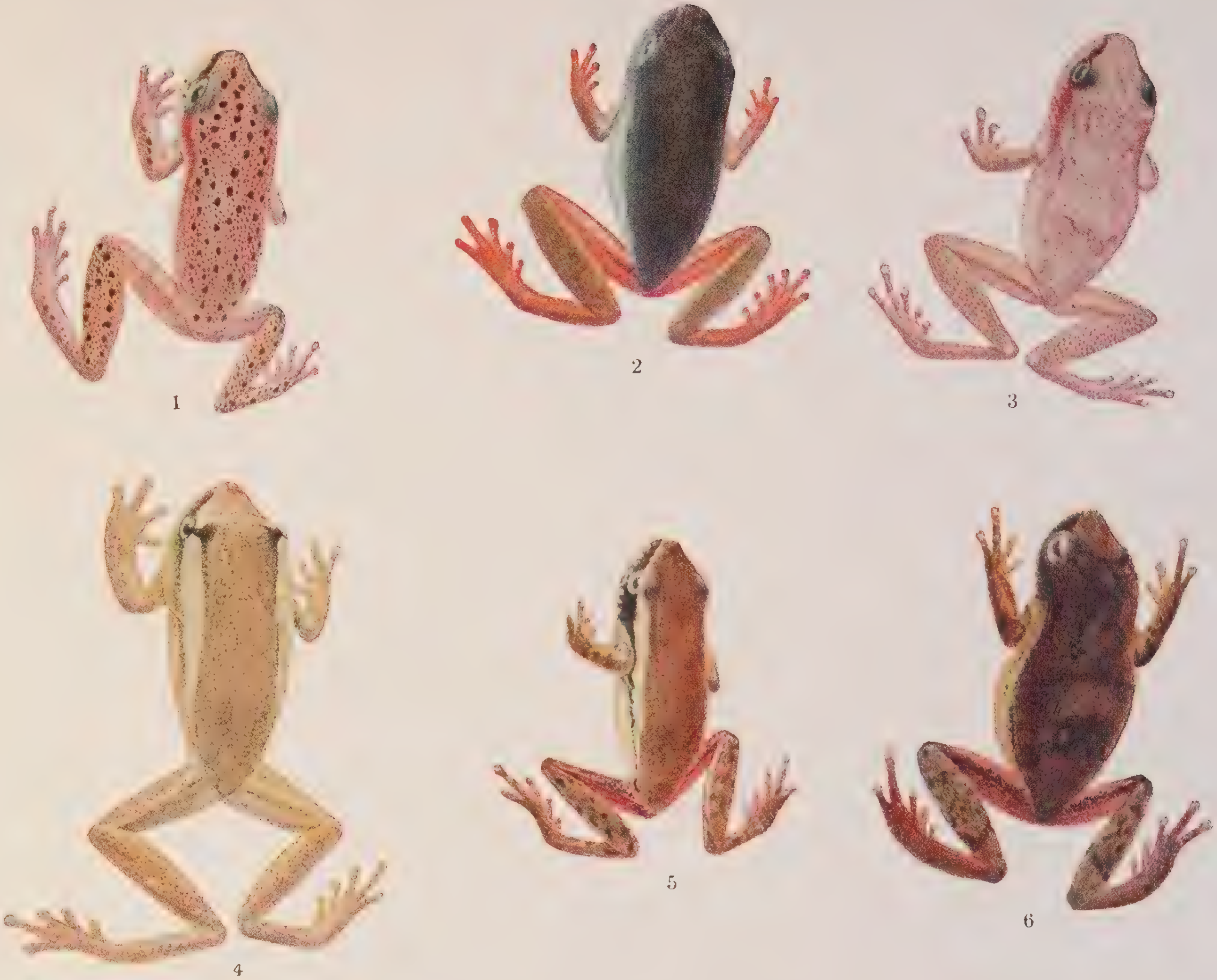
1 ex. (M.C.Z. 12035) Bonuta.

Structurally this 34 mm. frog agrees well with the species, though the tympanum is hidden. In alcohol it is uniformly blackish above. *Color in life.* "Mottled green and yellowish above." Formerly known from Spanish Guinea and French Congo.

Megalixalus fulvovittatus (Cope)

2 ex. (M.C.Z. 12024–5) Plantation No. 3, Du River.
1 ex. (M.C.Z. 12026) Gbanga.

These are topotypes in that only 'Liberia' is given for the type locality. *M. vittiger* (Peters) is undoubtedly a synonym. There are numerous minute black spines on the hind limbs of the male, a sexual character which assists in separating this species from *leptosomus* which it so closely resembles in color pattern. In *leptosomus* the hind limbs of both species are alike. The female is badly infected with some dermal (?dipterous) parasite that leaves swellings with central craters. There are eight of these around the anus, one on the right tibia, two on left flank and a twelfth in front of left foreleg. The male has one on the underside of its right thigh and several about the anus.



No. 465 (Figs. 1–6). — Liberian Tree Frogs of the genus *Hyperolius*, 2 x natural size

Fig. 1. — *H. ocellatus* Günther (MCZ No. 12009)
Fig. 2. — *H. concolor* (Hallowell) (MCZ No. 12021)
Fig. 3. — *H. ocellatus* Günther (MCZ No. 12006)
Fig. 4. — *H. pleurotaenia* (Boulenger) (MCZ No. 12015)
Fig. 5. — *H. puncticulatus* (Pfeffer) (MCZ No. 12016)
Fig. 6. — *H. festivus* sp. n. Type. (MCZ No. 12018)

Hyperolius concolor (Hallowell).

2 ex. (M.C.Z. 12021–2) Plantation No. 3, Du River.

These are topotypes, as the species was originally described from Liberia.

Hyperolius puncticulatus (Pfeffer)

1 ex. (M.C.Z. 12016) Gbanga, Liberia.
1 ex. (M.C.Z. 12017) Paiata, Liberia.

Originally described from Zanzibar, subsequently reported from Tanganyika Territory, these examples appear to be absolutely specifically identical with the specimens from Morogoro, one of which is figured by Miss Procter (P.Z.S. 1920, p. 415). The above specimens give a fresh extension of its range.

Hyperolius platyceps (Boulenger)

1 ex. (M.C.Z. 12023) Du River.

Compared with a topotype from Benito River, Gaboon, received in exchange from the British Museum, the striking dorsal marking is remarkably similar though in the Liberian frog its outline is a little more regular except posteriorly where two offshoots of the broad dorsal line unite with the coloring of the flanks. The original description states, "Outer fingers one-fourth webbed" but in both these specimens they are one-third webbed, again "toes two-thirds webbed" is a little misleading as the third and fifth toes are webbed to the discs in both specimens, the fourth toe is webbed to the second joint from the disc. While the topotype agrees with the type in that the tibio-tarsal articulation reaches the eye, in the Liberian frog it falls far short, only reaching the forearm.

Hyperolius festivus Barbour and Loveridge.

Hyperolius festivus Barbour and Loveridge, 1927, Proc. New Engl. Zoöl. Club, x, p. 17.

Type, no. 12018 Museum of Comparative Zoölogy, female, from Firestone Plantation No. 3, Du River, Liberia, collected by G. M. Allen, July, 1926. Three examples (M.C.Z., nos. 12018–12020), Firestone Plantation No. 3, Du River.

Description. — Head almost as broad as the body, broader than long; snout rounded, equal in length to only half the diameter of the eye, the profile of the tip vertical, canthus rostralis distinct; loreal region concave; the distance of the nostril to the end of the snout contained twice in its distance from the eye; interorbital space twice as broad as upper eyelid; some granules at corners of mouth; tympanum hidden. Outer fingers one half webbed, third and fifth toes webbed to the discs and to base of last joint from the discal joint on the fourth toe. Tibio-tarsal articulation of the adpressed hind limb reaches the eye (between eye and snout in half grown paratype); heels overlapping when the folded legs are held at right angles to the body; breadth of tibia contained four and a half times in its length; length of tibia contained exactly twice in length of head and body. Subarticular tubercles very flat; outer metatarsal tubercle on base of fifth finger long, rounded, not very conspicuous. Skin smooth above, granular on belly and posterior aspect of thighs.

Coloration. — Above rich brown, from snout to insertion of fore limb black, a black cross-band between the eyes extends to the middle of the back in a rather Arthroleptis-like vertebral marking, a lunar band across the back well in advance of hind limbs, some black, brown and white mottlings on sides. Incomplete bars and blotches on hind limbs; thighs, under side of tibia and portions of feet which are concealed when at rest, bright rose-red. Below, except for the white-mottled brown edges of the lips, pure white.

Measurements. — Snout to vent, 28; length of head, 8.5; breadth of head, 10; diameter of orbit, 3.5; length of tibia, 14; length of feet, 20; length of fourth toe, 12 mm.

Hyperolius pleurotaenia (Boulenger)

1 ex. (M.C.Z. 12015) Gbanga. 20. ix. 26.

Color in life. "Triangular area from snout to front third of eye and from posterior half of eye as a broad stripe three-quarters the length of body 'pale buff.' Central area of back and upper parts of fore and hind limbs 'rainette green' with minute scattered buff spots. Throat 'rainette green,' center of belly whitish, sides of belly translucent greenish. Thighs of upper half of tibia and the toes of all feet 'yellow ochre.'"

Hyperolius ocellatus Günther

14 ex. (M.C.Z. 12004–12013) Plantation No. 3, Du River.

1 ex. (M.C.Z. 12014) Paiata, St. Paul's River.

While without doubt these frogs are referable to *H. ocellatus* which Günther described from Fernando Po and Angola, it would almost appear as if *H. guttatus* described by Peters from Ashanti is identical though without topotypical material we hesitate to give a definite opinion.

Collector's color descriptions. Plantation No. 3, Du River, "Throat and belly orange yellow, underside of fore and hind legs and feet bright chestnut; brownish grey above." "Throat and lower lips citron green to mignonette green; stripe from eye to hip citron yellow, back between stripes and sides mignonette green overlaid with mikado brown. Belly white in center, tea green on lower belly and legs." D. H. Linder.

APPENDIX 1

LIST OF LIBERIAN REPTILES NOT COLLECTED BY THE HARVARD-LIBERIAN EXPEDITION

Crocodylus niloticus (Linné).
Chelonia imbricata (Linné).
Chelonia mydas (Linné).
Pelusios adansonii (Schweigger).
Pelusios derbianus (Gray).
Pelusios (*nigricans castaneus* [Schweigger], of doubtful occurrence).
Dermochelys coriacea (Linné).
Bothropthalmus lineatus Peters.
Boaedon virgatus (Hallowell).
Chlorophis irregularis (Leach).
Rhamnophis aethiopissa Günther.
Thrasops flavigularis (Hallowell).
Boiga pulverulenta (Fischer).
Aparallactus anomalus (Boulenger).
Naja nigricollis Reinhardt.
(*Dendraspis jamesonii* [Traill], of doubtful occurrence).
Atractaspis corpulenta (Hallowell), recorded by Johnston.
Atractaspis irregularis (Reinhardt), recorded by Johnston.
Lygodactylus gutturalis (Bocage).
Amphisbaena liberiensis (Boulenger).
Mabuya maculilabris (Gray).
Chamaeleo senegalensis Daudin.

Arthroleptis gutterosus Chabanaud.
Megalixalus fornasinii (Bianconi).
Hyperolius fuscigula Bocage, recorded by Büttikofer.
Hyperolius fusciventris Peters.
Hyperolius marmoratus Rapp, recorded by Chabanaud.

APPENDIX 2

The junior author has recently examined and identified a small collection of Liberian Amphibia in the United States National Museum. While there is only one species new to the Liberian list (*Hylambates* now *Leptopelis bocagii*) it seems worth while recording them for locality, particularly so because the collectors have been careful to give the native names in many cases. The collectors were Messrs. R. P. Currie, O. F. Cook, and G. N. Collins, and all specimens were taken in 1895 at Mount Coffee with the exception of one specimen of *Hyperolius concolor* collected by G. P. Gell at the Muhlenberg Mission.

BUFONIDAE

14 *Bufo regularis regularis* Reuss. "Bŏkŏ." (U.S.N.M. 24185, 24296–308.)

RANIDAE

1 *Rana albolabris* Hallowell. (U.S.N.M. 24211.)
14 *Rana bibronii* Hallowell. (U.S.N.M. 20843–4, 22842–3, 24155–7, "Bwing-bi." 24159–60, 24182, 24209–10, 24320, 24323.)
4 *Rana occipitalis* Günther, "Zū-wéng." (U.S.N.M. 24186, 24309–11.)
1 ? *Arthroleptis poecilonotus* Peters. (U.S.N.M. 22848.)

This individual possesses a somewhat broader head than any of the series in the Museum of Comparative Zoölogy.

5 ? *Arthroleptis taeniatus* Boulenger. (U.S.N.M. 22846–7, 22849, 22851, 24212.)

While there seems little doubt as to the correct identification of some of these specimens with *taeniatus*, others are in such a poor state of preservation that their determination should be accepted with reserve.

1 *Leptopelis bocagii* (Boulenger). (U.S.N.M. 24158.)
2 *Leptopelis tessmanni* Nieden. "Yah-kurah" = Bush Frog. (U.S.N.M. 24312, 24324.)
7 *Megalixalus fulvovittatus* (Cope). (U.S.N.M. 24183, 24313–8.)
3 *Hyperolius concolor* (Hallowell). (U.S.N.M. 20842, 22850, 23978.)
2 *Hyperolius pleurotaeniatus* (Boulenger). (U.S.N.M. 24325–6.)

The large female is labelled "Boáh," the smaller male "Boáh-bi." The "bi" is probably a diminutive.

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REPTILES AND AMPHIBIANS FROM THE CENTRAL AFRICAN LAKE REGION

By T. Barbour and A. Loveridge

The Harvard African Expedition of 1927, under the leadership of Professor R. P. Strong secured a number of reptiles and amphibians in the mountains to the north of Lake Kivu and in the surrounding region. These form the subject of the present notes, where B.C. is employed as an abbreviation for Belgian Congo. A new species of *Arthroleptis* from Mt. Vissoke, recently described from this collection, has the description repeated here.

SNAKES

Typhlops punctatus (Leach)

1 (M.C.Z. 26652). ? Irumu, B.C.

A large specimen with 28 scale rows, of a bronzy-greenish-black above and uniformly yellow below, nearest to var. B.b. of Boulenger's catalogue, volume I, p. 43.

Boaedon lineatus Duméril and Bibron

3 (M.C.Z. 25146–8) Bunia, Irumu, B.C., iv. 1927.

Three young and normal examples of this very common species.

Lycophidion capense (A. Smith)

2 (M.C.Z. 24741–2) Lulenga, B.C., 1. iii. 27.

1 (M.C.Z. 25149) Bunia, Irumu, B.C., iv. 1927.

The scale counts of the three specimens are Sc. 17, V. 181–191, A. 1, C. 33–42, L. 7–8 with the 3rd, 4th and 5th labials entering the eye. All well within the known range of variation for this species.

Homalosoma lutrix (Linné)

2 (M.C.Z. 24743–4) Lulenga, B.C., 1. iii. 27.

The scale counts are Sc. 15, V. 136–139, A. 1, C. 22–21, L. 6, 3rd and 4th entering eye. No. 24743 has four subcaudals entire. No. 24744 which measures 354 (320 + 34) mm. has two embryos measuring approximately 100 mm. each, tied to it. In alcohol they are uniformly plumbeous above, blue-gray below.

Dasypeltis scaber (Linné)

1 (M.C.Z. 24745) Kibati, B.C., 25. iii. 27.

1 (M.C.Z. 25150) Bunia, B.C., ? iv. 1927.

The Kibati specimen has the dorsal pattern of rhombs, while the Bunia snake is uniformly brown. The scale counts are: — Sc. 26–24, V. 217–222, A. 1, C. 53–58, L. 7. 3rd and 4th entering eye.

Naja melanoleuca Hallowell

1 (M.C.Z. 24746) Bumba, B.C., iii. 1927.

This formidable cobra measured two and a half metres according to a note by the collector — Dr. J. Bequaert — who preserved linguatulids from it.

Causus rhombeatus (Lichtenstein)

1 (M.C.Z. 25151) Bunia, B.C., iv. 1927.

A very juvenile night adder.

Bitis arietans (Merrem)

1 (M.C.Z. 25152) Bunia, B.C., iv. 1927.

In addition to this young snake the very mutilated head of a Common Puff Adder was received. It was collected at Mai-Ivwi, Ruchuru Plains on 30. iii. 27 by Dr. R. P. Strong.

Atheris squamiger (Hallowell)

1 (M.C.Z. 24748) Leopoldville, B.C., 2 xii. 26.

The formula of this tree viper is Sc. 19, V. 147, A. 1, Sc. 57, L. 8. The specimen was collected and presented by Dr. Van den Branden.

Atheris nitschei Tornier.

1 (M.C.Z. 24747) Burunga, B.C., 12. iii. 27.

This rare snake was a welcome addition to the collection of the Museum of Comparative Zoology which had only one other example (M.C.Z. 19768) collected on April 8th, 1924, at Lake Mutanda, Northern Ruanda, by Dr. J. C. Phillips. The formula of these two snakes, taking that of the Lake Mutanda specimen first, is Sc. 26–31, V. 157–161, A. 1, Sc. 35–40, L. 10–9 and 10–10. Those of the types were Sc. 25–27, V. 144–155, A. 1, Sc. 40, L. 11-12. The reduction in the upper labials is clearly due to the fusion of what should be the 8th and 9th in the Burunga viper.

LIZARDS

Hemidactylus mabouia (Moreau de Jonnes)

5 (M.C.Z. 24749–53) Bumba, B.C.
1 (M.C.Z. 24754) Lulonga River, B.C.

The last mentioned house gecko was taken on board the steamer near Lulonga at the mouth of the river.

Lygodactylus picturatus gutturalis (Bocage)

6 (M.C.Z. 24755–60) Ruchuru, B.C.

Agama colonorum Daudin

6 (M.C.Z. 24767–72) Bumba, B.C.

These agree with Schmidt's Lower Congo specimens in having a range of 7–9 canthal and supraciliary scales.

Agama atricollis Smith

3 (M.C.Z. 24761–3) Kisenyi, Ruanda, ii. 1927.
12 (M.C.Z. 24764–6) Ruchuru, B.C.

Chamaesaura tenuior Günther

1 (M.C.Z. 24798) Kitende, Uganda.

Bedriagia tropidopholis Boulenger

1 (M.C.Z. 24797) Between Abumombasi and Modjomboli, B.C.

Lacerta vauereselli Tornier

1 (M.C.Z. 24796) Burunga, B.C.

The first specimen of this rare lizard to reach the Museum.

Lacerta jacksoni Boulenger

6 (M.C.Z. 24773–34) Ruchuru, B.C.
12 (M.C.Z. 24775–85) Kibati, B.C., 25. iii. 27.
10 (M.C.Z. 24786–95) Lulenga, B.C., iii. 27.

This series offers the opportunity to present rather extensive notes on what has been considered a rather rare species. In our series there are:

(1) 8 plates in collar of which always 2, sometimes 3, are very much smaller than the others.
(2) 8 longitudinal rows of ventral plates of which the outermost pair are very much reduced.
(3) 12 to 19 femoral pores on each side, the lower number in females in which they are often extremely difficult to discern.

In addition, by carefully examining and measuring each of these specimens our knowledge of the range of variation in this lizard is greatly extended. The following description is based on Dr. Bequaert's series, information in brackets refers to the type which is the only other known specimen.

Description. Body not depressed. Head feebly depressed, $1\frac{1}{3}$ to $1\frac{3}{4}$ times, with an average of $1\frac{1}{2}$ times, as long as broad; snout obtuse. The adpressed hind limb reaches to the wrist or as far as the axilla of the fore limb, usually barely to the elbow; foot equal to, or a little longer or a little shorter, than the head.

Head shields as in *A. africanus;* four upper labials anterior to the subocular, in No. 24785 only three on the right side, in No. 24786 and a duplicate lizard five, on the right side, normal four on the other. Temporal scales small, flat, smooth. Gular scales smooth small anteriorly increasing in size toward the collar, twenty-five in a longitudinal series; gular fold slight or absent. Collar with very slightly serrated edge, composed of eight or nine plates of which always two, sometimes three of the outer ones are very much smaller than the others.

Dorsal scales rhombic, slightly imbricating with sharp diagonal keels; lateral scales smaller, two or three rows corresponding to a ventral plate; thirty-one to forty-two scales across the middle of the body exclusive of the ventral plates which are in eight series, the outer row much smaller than the others. Ventrals in twenty-two to twenty-seven transverse series. Preanal plate large, with a single plate before it and smaller scales on the sides. Twelve to nineteen femoral pores on either side rarely the same number on both sides of the same animal. Nineteen to twenty-five lamellar scales under the fourth toe but the whole series not examined. Upper caudal scales much longer than broad, strongly keeled and very slightly mucronate; lower scales distinctly but less sharply keeled.

Coloration. Black above, bronzy on the mid-dorsal area, with many scattered small light bluish dots; lower surfaces of limbs gamboge yellow; throat and belly slaty, lighter on the midventral area; lips not yellow, tail white below, dark slaty above.

Measurements of male No. 24773.

Head and body	69 mm.
Tail	90 "
Length of head	19 "
Width of head	13 "
Depth of head	10 "
Fore limb	28 "
Hind limb	38 "
Foot	22 "

The largest specimen in body length measured 174 (76 + 98) while one measuring 182 (69 + 113) mm. had a longer tail; the smallest was 88 (41 + 47) mm.

Diet. (1) A big spider. (2) Four caterpillars. (3) Grasshopper legs and beetle elytra. (4) A slug.

Habitat. Found by Dr. Bequaert to be common on fields of dark-colored lava rocks among which were scattered stunted trees.

Mabuya maculilabris (Gray)

1 (M.C.Z. 24811) São Thomé Id. W. Africa.
1 (M.C.Z. 24812) R. Lulonga, B.C.
5 (M.C.Z. 24813–7) Ruchuru, B.C.
6 (M.C.Z. 24818–23) Bumba, B.C.

The status of the various races of *maculilabris*, proposed for the Congo and Central Lake region by Sternfeld, has been recently discussed by us,[1] when the variation of the above series was also dealt with.

The Lulonga skink was taken on board ship near the mouth of the Lulonga River.

Mabuya striata (Peters)

1 (M.C.Z. 24799) Kigoma, Tanganyika Territory.
4 (M.C.Z. 24800–03) Lulenga, B.C.
7 (M.C.Z. 24804–10) Ruchuru, B.C.

CHAMELEONS

Chamaeleon gracilis etiennei (Schmidt)

1 (M.C.Z. 24825) Kinshasa, B.C.

A male without trace of a tarsal process thus agreeing with Schmidt's *C. etiennei* from Banana at the mouth of the Congo River, a locality not far distant from Kinshasa near Leopoldville.

Chamaeleon dilepis dilepis Leach

1 (M.C.Z. 24824) Uvira, B.C.

The occipital lobes are rather small but not so small as to make this half-grown specimen referable to *C. d. quilensis* Bocage.

Chamaeleon bitaeniatus rudis Boulenger

1 (M.C.Z. 24826) Mt. Ninagongo, B.C. 9,200 feet.
1 (M.C.Z. 24827) Kabara, S. W. Mikeno, B.C. 10,600 feet.

Chamaeleon bitaeniatus ellioti Günther

1 (M.C.Z. 24828) Karambi, B.C.
4 (M.C.Z. 24829–32) Ruchuru, B.C.
14 (M.C.Z. 24833–42) Kisenyi, B.C.
18 (M.C.Z. 24843–60) Lulenga, B.C.

Sternfeld, possibly correctly, considered that both *ellioti* and *rudis* were subspecies of *C. bitaeniatus*. *C. ellioti* appears to inhabit the mountains of the

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[1] Barbour & Loveridge, 1928, Mem. Mus. Comp. Zool., vol. L, p. 157.

Central Lake region at a lower level than *rudis*. Insufficient allowance has been made for a reasonable amount of variation in these creatures where different vegetational and climatic environments may occur in close proximity.

The races of *bitaeniatus* which Sternfeld proposed do not seem to be well characterized, but it is almost impossible to place them in the synonymy without examining the types. It is to be hoped that workers in Berlin will reinvestigate these with a view to settling their identity.

Some of the forms from this region, if races of *bitaeniatus*, would be as follows: —

Ch. b. ellioti Günther, 1895. Foot of Ruwenzori, Uganda.
Ch. b. rudis Boulenger, 1906. Mubuku Valley, Ruwenzori, Uganda.
Ch. b. bergeri Sternfeld, 1912. Sirgoit, Kenya Colony. Based on 1 male.
Ch. b. graueri Sternfeld, 1912. Bugoie & Rugege Forests.
Ch. b. tornieri Sternfeld, 1912. Lendu Plateau and Banjeroberg, West of Lake Albert.
Ch. b. bequaerti de Witte, 1922. Beni, Belgian Congo.

Others have been described from Massai-land, Kilimanjaro, and Kenia.

Chamaeleon johnstoni Boulenger

Ch. graueri Steindachner, 1911, Anz. Ak. Wiss., Wien, p. 177 (West of Lake Tanganyika).
Ch. johnstoni affinis Sternfeld, 1912, Ergebn. Deutsch. Zentralafr. Exp. 1907–1908. v. IV, 2, p. 260 (Northwest bank of Lake Tanganyika).
Ch. ituriensis Schmidt, 1919, Bull. Am. Mus. Nat. Hist., XXXIX, Art. ii, pp. 589–593. (Medje, Belgian Congo).

1 (M.C.Z. 24861) Kisenyi, North shore of Lake Kivu.
18 (M.C.Z. 24862–79) Lulenga, B.C.

In addition to the above we have as comparative material a cotype of *C. johnstoni* from Mt. Ruwenzori, a paratype of *Ch. graueri* from Northwest Lake Tanganyika, and three paratypes of *Ch. ituriensis* from Medje. Sternfeld's species was based on a single female and a young one and his type locality is practically that of *Ch. graueri*.

In describing *C. ituriensis* Schmidt hinted that it might be synonymous with *Ch. j. affinis* and he since informs us that it is undoubtedly a synonym of *C. johnstoni*. The present fine series collected by Dr. Bequaert enables us to bridge over all those small differences on which the alleged *Ch. graueri* and *Ch. j. affinis* were based, the latter was differentiated on account of the large plate-like lateral scales, but in our series these scales are to be found in every stage of development, or almost undifferentiated.

AMPHIBIA

Xenopus laevis (Peters)

2 (M.C.Z. 14616–7) Lake Bunyoni, Uganda.

Both half grown measuring 34 mm. from snout to vent. First fingers almost equal to fourth, shorter than second which is shorter than the third. Much spotted and reticulated beneath.

Bufo regularis regularis Reuss

3 juv. (M.C.Z. 14618–20) Kabale, Uganda.
4 (M.C.Z. 14621–24) Lulenga, B.C. iii. 27.

1 (M.C.Z. 14625) Kisenyi, Ruanda.
1 (M.C.Z. 14626) S.W. edge of Mikeno, B.C. 2500 meters.
1 (M.C.Z. 14627) Ruchuru, B.C.

In the three juveniles (measuring 15, 20 and 25 mm.) the first finger is equal to, or shorter than, the second; the tympanum is only two-thirds the diameter of the eye as in *dodsoni*. The asperities and rugosities of the largest Lulenga toad (83 mm.) are very pronounced, the others from the same locality are more normal. The adult from Mikeno crater is black and almost devoid of markings above.

Rana fuscigula Duméril and Bibron

10 (M.C.Z. 14635–43) Behungi Escarpment, Uganda.

The series consists of juvenile frogs from 27 to 32 mm. in length and a tadpole 82 mm. from nose to tail tip, its hind legs are 23 mm. long, but the front legs have not appeared. The series was collected on March 5th, 1927, in a marsh at an altitude of 7900 feet.

We are indebted to Dr. G. de Witte for the identification of these young frogs which make an interesting addition to the fauna of Uganda. Lönnberg[1] has reported on seven young specimens taken on Mt. Meru between three and four thousand meters, the identification being attributed to Boulenger. Our specimens agree with Lönnberg's in that the webbing of the hind feet is rather more deeply emarginate than in South African frogs of the same size. Noble[2] in his 1924 check list gives the range of this frog as "Cape Colony northward to Nyasaland; recorded as far north as Abyssinia and South-west Africa, but probably due to confusion with closely related species."

Rana mascareniensis Duméril and Bibron

1 (M.C.Z. 14628) Behungi Escarpment, Uganda. 7900 feet.
6 (M.C.Z. 14629–34) Lulenga, B.C. 1850 meters.

The series measures 34 to 53 mm. and though all agree in having the interorbital space broader than the upper eyelid as in *R. venusta* Werner which was described from Mongalla, Lagos, Entebbe, and Victoria Nyanza, this character is of somewhat doubtful importance so that for the present, at least, we prefer to record our specimens under the earlier name of *R. mascareniensis*.

Phrynobatrachus perpalmatus Boulenger

5 (M.C.Z. 14645–9) Budjalibala, near Lisala, B.C.

The frogs in this series, ranging from 10 to 25 mm. in length, have been compared with examples from Stanleyville, B.C., collected by Messrs. Lang and Chapin, with which they agree in every detail. The largest frog, a female, held undeveloped ova; in its stomach was a single large homopterous insect.

Phrynobatrachus versicolor Ahl

35 (M.C.Z. 14650–75) Lulenga, B.C., alt. 1850 meters.

The series ranges from 20 to 40 mm. long. The latter is the maximum measurement given by Ahl for his paratype series of two hundred and fifteen specimens from the rain forest to the northwest of Tanganyika, the actual localities being Rugege and Bugoie Forest. A character of great interest which at once shows its relation to *P. krefftii* is the spinose character of the soles of the feet in *both* sexes whereas in *P. krefftii* only the males show such spinosities. A female, 32 mm. long, shows developing ova while the smallest frog, 20 mm. long, has a tail stump 11 mm. in length. The stomach of the only specimen examined held homopterous insects.

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[1] Lönnberg, 1907, in Sjöstedt, Kilimandjaro-Meru Exp., I, part 4, p. 21.
[2] Noble, 1924, Bull. Am. Mus. Nat. Hist., XLIX, p. 339.

Phrynobatrachus graueri (Nieden)

5 (M.C.Z. 14676–80) Lulenga, B.C. 1850 meters.
7 (M.C.Z. 14681–87) Rueru, B.C. 8500 feet.
4 (M.C.Z. 14688–91) Burunga, B.C. 1800 meters.
2 (M.C.Z. 14692–93) S.W. foot of Mt. Mikeno, B.C. 7250 feet.
1 (M.C.Z. 146–94) Kivu, Mt. Mikeno.
1 (M.C.Z. 14695) Behungi Escarpment, Uganda, 7900 feet.

The series ranges from 12–30 mm. long. Nieden based his description on a single frog 22 mm. in length from Rugege Forest so that our specimens, as also our *P. versicolor* are almost topotypes. For purposes of comparison we have received a 22 mm. example from the British Museum which comes from the Yala River district of Kenya Colony.

One of the largest frogs in the present series is a female distended with eggs to its greatest capacity, its greatest width being equal to half its length. In this specimen, as well as the next two largest, which are both males, the tibio-tarsal articulation of the adpressed hind limb reaches only to the eye, while in the rest of the series it reaches to the tip of the snout or beyond.

A distinctive feature of this species, though not mentioned in the original description, is the pair of plicae converging from the orbits and widening again on the back, a character which it shares with *P. acridoides* as well as other species.

The stomachs of two males held a staphylinid beetle, cercopid bug, ants' heads and the remains of several small grasshoppers.

Arthroleptis adolfi-friederici Nieden

1 (M.C.Z. 14696) Kibati, B.C. 6500 feet.

A female, 38 mm. in length, with undeveloped ovules. A very young centipede, a millipede, beetle larvae of two species, and a weevil were indentifiable among the insect remains in its stomach.

Arthroleptis bequaerti Barbour and Loveridge.

Arthroleptis bequaerti Barbour and Loveridge, 1929, Proc. New. Eng. Zoöl. Club., XI, pp. 25–26.

25 (M.C.Z. 14751–75) Mt. Vissoke, B.C. 8–9,000 feet.

Type. No. 14751, Museum of Comparative Zoölogy, an adult female from a swamp on Mt. Vissoke, Belgian Congo, 8–9,000 feet, collected by Dr. J. Derscheid for Dr. J. Bequaert.

Paratypes. The rest of the series mentioned above together with a single specimen in the Congo Museum.

Relations. Very near to *A. minutus* of which form it is probably an offshoot. Distinguished by its large size, very distinct tympanum, thicker fingers and toes, and the slightly dilated tips of both fingers and toes.

Description. Habit moderate. Tongue with a median conical papilla, as broad as long (or longer than broad). Snout rounded, projecting slightly beyond the mouth, shorter than the diameter of orbit; nostril midway between end of snout and orbit; interorbital space considerably broader than the upper eyelid; tympanum very distinct. Fingers moderate, first shorter than the second which is slightly shorter than the fourth, third about twice the length of first, unwebbed. Toes moderate, about one third webbed except the fourth where the web extends forward as a very narrow margin to the second joint from the end, tips of fingers and toes slightly dilated or thickened, subarticular tubercles well developed, an inner and an outer metatarsal as well as a tarsal tubercle all of which are very small, the tarsal being about as far from the inner metatarsal as the latter is from the outer, a slight skinfold from the tarsal to the inner metatarsal tubercle. The tibiotarsal articulation of the adpressed hind limb reaches to the nostril (to eye or nostril, or between, in the paratype series). Skin above and below smooth.

Coloration. Above, uniform brown. Below, white, mottled and vermiculated with dusky brown on the throat and chest; belly and thighs immaculate, edge of lower lip, soles of hands and feet plumbeus. The paratype series show much variation, twelve have a moderately narrow chocolate brown vertebral stripe from snout to anus. The young are usually paler brown showing some barring on the limbs. Below, the throat and underparts may be almost immaculate, or with a few large spots or so covered with minute speckling as to appear dusky.

Measurements.	Snout to vent	22 mm.
	Length of head	7 mm.
	Breadth of head	7 mm.
	Diameter of orbit	2 mm.
	Length of tibia	11.5 mm.
	Length of foot	15 mm.
	Length of 4th toe	7 mm.

Paratype series range from 12 to 25 mm. all of the latter size being females.

Material. The possibilities of identity with *moorii, feae, ogoensis, schubotzi* or *rouxi* has been carefully gone into, and close comparison made with specimens of *minutus* from various East African localities.

Breeding. Ovules large (1.3 mm. in type ♀) in all adult females.

Hyperolius guttulatus Günther

1 (M.C.Z. 14699) Uvira, B.C.

We are indebted to Dr. Gaston de Witte for the identification of this 34 mm. adult male frog. *H. guttulatus* was described by Günther in 1858 from specimens of unknown habitat. Noble, in his 1924 check list of African amphibia, says "Known only from the type specimens." Dr. Bequaert's capture is, therefore, of considerable interest.

The frog agrees perfectly with the somewhat meagre structural description but differs considerably in coloration, for instead of being "finely white dotted" it has a series of five large light, dark-edged, spots along the vertebral line, the foremost being the largest and covering the interorbital space. There is also a light, dark-edged above, lateral band commencing on the upper eyelid. The band is, however, very indefinite, merging into the white of the under side below and more or less broken up on one flank. On the tibiae, which are light colored, there is a dark longitudinal stripe followed by two transverse bars of the same color; three or four dark spots are present on each fore arm.

Hyperolius pleurotaenius (Boulenger)

33 (M.C.Z. 14700–25) Burunga, B.C.

43 (M.C.Z. 14726–50) Foot of Mt. Mikeno, B.C. 14. iii. 27.

One Burunga female frog measures 33 mm., the type was 31 mm. The fine Mikeno series ranges in size from 11 to 31 mm. frogs. The smallest, 11–12 mm., are pallid with dusky specklings above, a light, speckle-free, band runs from the nostril along the canthus, then above the eye to the flanks, anteriorly it is bordered above and below by a dusky band formed by a concentration of the dorsal specklings.

Medium-sized frogs of 21 mm. are somewhat darker, have lost the light canthal and lateral line, but retain a single dark line in these regions, the back is mottled with dusky spots or vermiculations, the limbs also to a lesser degree. The feet show pinkish a year after preservation.

Individuals from 22 to 25 mm. are purplish-brown with a well-defined dark canthal-lateral band and usually (eleven out of nineteen specimens) exhibit dark dorsal spots or vermiculations.

Frogs from 28 to 31 mm. are usually purplish or reddish brown though four out of nineteen are cream-colored, all exhibit the dark canthal-rostral band while four of the nineteen, though not the pallid ones, show darker spots or vermiculations on the back.

These agree structurally with frogs from Medje, Belgian Congo, referred by Noble to this species, except for a slight spinosity of the skin in the region of the snout, probably brought out by a difference in methods of preservation. They agree also with Medje specimens in lacking light dorsal spots, but differ from them in showing no light canthal-lateral band in the adults. Undoubtedly the whole series represent one species though to avoid confusion the above color notes are based on the Mikeno series only, one Burunga specimen lacks even the dark canthal-lateral line.

The large Burunga female held well-developed, pigmented eggs when caught on March 22nd, 1927; her stomach contained beetle elytra.

Hyperolius ? pusillus (Cope), **? marmoratus** Rapp

Crumenifera pusilla Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 343.

2 (M.C.Z. 14697–8) Kisumu, Kenya Colony.

In referring these two female frogs to *pusillus* we wish to record only their specific identity with Congo specimens which Noble [1] considered to be *pusillus;* they have also been compared with one of the three Kisumu frogs which Angel [2] referred to *Rappia guttulata* Günther. All are one species. If Cope was correct in giving the type locality of his species as Umvoti, Natal (it was changed to "Umvoti, West Africa" by Boulenger in 1882, though we know of no other Umvoti than the Natal locality) then the distribution of the species leads us to suppose that two distinct frogs are being recorded under this name,

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[1] Noble, 1924, Bull. Am. Mus. Nat. Hist., XLIX, p. 256.

[2] Angel, 1925, in Voyage de Ch. Alluaud et R. Jeannel en Afrique Orientale (1911–1912). Reptiles et Batraciens, p. 52.

Library
Arizona State Museum

one is West African ranging as far east as Kisumu, the other is a Southeast African species rarely mentioned in the literature. *H. pusillus* was omitted from Boulenger's 1910 list of South African reptiles and batrachians and on applying his key to these Kisumu or to Noble's Congo frogs they fall to *marmoratus*. Until someone undertakes a revision of the genus it seems better to record our frogs as above rather than add to an already complicated bibliography.

The total length of these Kisumu specimens is 26 and 28 mm. respectively. They differ from the descriptions of *pusillus*, *marmoratus*, and from Noble's Congo frogs in that the brownish-orange spots on the back are distinctly raised, apart from this, however, they agree structurally with both *pusillus* and *marmoratus*. The larger is purplish-brown showing a few dark purple vermiculations and numerous dark orange spots on the sides; the smaller is yellowish-brown above with numerous purplish, as well as bright orange, spots upon the back. Both are white below speckled with orange, and with minute black specks on the throat.

Both hold developing pigmented eggs. In the stomach of one the limbs of grasshoppers are recognizable.

Cacosternum boettgeri (Boulenger)

1 (M.C.Z.14776) West of Mbarara, Kitende, Uganda.

This 22 mm. specimen appears to constitute the first published record of the occurrence of this little Brevicepitid in Uganda. It agrees very closely with examples from the Plat River, Northwestern Transvaal, though possibly a trifle slenderer in form.

Hewitt[1] has recently described a race of this toad from Mariannhill, Natal, under the name of *C. b. albiventer* and states that it occurs in the forest at Grahamstown, while the typical form with spotted abdomen is found at Grahamstown outside the forest. In passing it might be stated that of three specimens labelled "Grahamstown" received by exchange from Dr. Boulenger, one (M.C.Z. No. 2903) has an immaculate belly but this is not correlated with a more rounded snout; in external characters the three specimens appear the same. Our Plat River specimens (M.C.Z. Nos. 10791–2) while possessing mottled abdomens lack the black stripe from nostril to eye and from eye to base of fore limb which Hewitt states is characteristic of all typical *boettgeri*.

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[1] Hewitt, 1926, Ann. Natal Mus., V, p. 438.

XXXVI

ENTOMOLOGY

MEDICAL AND ECONOMIC ENTOMOLOGY

By J. Bequaert

The Arthropoda collected during the Harvard African Expedition are so numerous that it is impossible to even enumerate them all in this Report, since many of them are as yet unidentified. I have therefore limited my studies chiefly to groups that are of medical or economic significance, though I have included lists or brief accounts of some others that are of especial interest on account of their habits or distribution.

To my own Report are appended a series of entomological contributions prepared by some of my colleagues, all of whom I wish to thank for their kind help. In some groups, I have also been greatly assisted with identifications by specialists. For such help I am indebted to Mr. Nathan Banks (in the Ricinulei), Dr. H. E. Ewing (in the mites, sucking lice, biting lice and fleas), Prof. Alfred Emerson (in the termites), Mr. J. A. G. Rehn (in the Orthoptera), Mr. F. W. Edwards (in the mosquitoes and midges), Dr. J. Waterston (in the biting lice), and Dr. W. Horn (in the tiger-beetles).

In addition to the contributions contained in the present Report, the following papers dealing partly or wholly with insects obtained by the Harvard Expedition, have been published elsewhere.

Cockerell, T. D. A. 1930. 'A new African genus of Ceratinidae.' Rev. Zool. Bot. Afric., XVIII, 3–4, pp. 291–293.

1930. 'African bees of the family Xylocopidae, principally from Liberia and the Belgian Congo.' Rev. Zool. Bot. Agric., XVIII, 3–4, pp. 294–306.

1930. 'African bees of the family Anthophoridae chiefly from the Belgian Congo and Liberia.' Rev. Zool. Bot. Afric., XVIII, 3–4, pp. 331–343.

1930. 'African bees of the family Ctenoplectridae from the Belgian Congo and Liberia.' Rev. Zool. Bot. Afric., XVIII, 3–4, pp. 358–363.

Curran, C. H. 1929. 'Nineteen new Diptera from Africa.' American Mus. Novitates, No. 340, pp. 1–15.

1929. 'New Dolichopodidae from Liberia and the Belgian Congo.' American Mus. Novitates, No. 391, pp. 1–10.

Felt, E. P. 1928. 'A new African gall midge.' Jl. New York Ent. Soc., XXXVI, pp. 123–124.

Forsius, R. 1928. 'On some Tenthredinoidea collected by Dr. J. Bequaert in Central Africa.' Rev. Zool. Bot. Afric., XVI, 3, pp. 326–334.

Schmitz, H. 1929. 'Zur Kenntnis einiger von Dr. Jos. Bequaert gesammelter afrikanischer Phoriden.' Rev. Zool. Bot. Afric., XVIII, 1, pp. 37–43.

Other papers on bees (Apoidea), by Prof. T. D. A. Cockerell, and a paper on Dermaptera, by Prof. Carlo Menozzi, are now going through the press.

ARACHNOIDEA

LINGUATULIDA

LINGUATULIDAE

I have in my collection a number of African specimens of this interesting family of parasites, the correct affinities of which are still open to discussion. Thus far I have been unable to have them identified. I believe, nevertheless, that the records of the hosts may be of some value.

1. Two adult parasites from the lung of a snake, *Naja melanoleuca* Hallowell. Bumba, Belgian Congo, January 3, 1927 (J. Bequaert).
2. One adult parasite from the lung of a snake, *Python sebae* (Gmelin). Ruchuru, Belgian Congo, February 21, 1927 (J. Bequaert).
3. Three adult parasites from the lung of a snake, *Bitis nasicornis* (Shaw). Memmeh Town, Liberia, August 29, 1926 (J. Bequaert).
4. Adult parasites from the pancreas of a genet, *Genetta stuhlmanni* Matschie. Mt. Lutundi, Usambara Mountains, Tanganyika Territory, December 11, 1926 (Arthur Loveridge).
5. Two adult parasites from the liver of a leopard, *Felis pardus* Linnaeus. Ruchuru Plains, Belgian Congo, February 17, 1927 (R. P. Strong).
6. One adult parasite from the mesentery of an aardvark, *Orycteropus afer* (Pallas). Faradje, Belgian Congo, January 12, 1909 (H. Lang and J. P. Chapin).

RICINULEI

RICINOIDIDAE

(*Cryptostemmatidae*)

Ricinoides plebejus (Hansen and Sörensen)

Cryptostemma plebejum Hansen and Sörensen, 1904, 'On Two Orders of Arachnida,' p. 148, Pl. VII, figs. 2*a-f* (immature ♀; near the town of Togo, Dahomey).
Ricinoides plebejum Ewing, 1929, Ann. Ent. Soc. America, XXII, p. 597.

Liberia. — Paiata, three females, under decaying leaves partly embedded in mud, in very low, swampy forest, near the banks of the St. Paul's River, October 1926.

These remarkable arachnids, which Mr. Nathan Banks very kindly identified for me, are true living fossils. The order Ricinulei comprises two living and two extinct genera. The fossil genera, *Curculioides* Buckland (originally described as a beetle) and *Polyochera* Scudder, are strictly Palaeozoic, being both represented by a few species in the Carboniferous of England and North America (Illinois). The few living forms have a peculiarly restricted distribution in the tropics. In America, the genus *Cryptocellus* Westwood, with six species, is known from Guatemala, Costa Rica, Colombia, and the Amazon Basin. In Africa, the genus *Ricinoides* Ewing (*Cryptostemma* Guérin), with six species, has been found only in the coastal forest belt of Upper Guinea, in Sierra Leone, Liberia, Dahomey (formerly Togo), Cameroon, and Rio Muni (Rio Benito).[1] It is one of the few faunal elements which Upper Guinea has in common with the Neotropical Region. The distribution of the living Ricinulei is therefore analogous to that of the Rapataceae, a family of monocotyledonous plants of South America, represented in Liberia by one genus, *Maschalocephalus*.

ACARINA

IXODIDAE

Ixodes rasus Neumann

Ixodes rasus Neumann, 1899, Mém. Soc. Zool. France, XII, p. 137, figs. 12–14 (♂ ♀; off *Procavia*, Congo); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 26 (♂ ♀). Nuttall and Warburton, 1911, 'Ticks, Part II, *Ixodes*,' p. 228, figs. 224–226 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 318, figs. 7–8 (♂ ♀); 1916, Parasitology, VIII, p. 331.

Tanganyika Territory. — Tanga, several females off a species of *Cephalophus* (Arthur Loveridge).

This species has a rather wide distribution, being recorded from the Gold Coast, Togo, Cameroon, French Congo, Belgian Congo, Uganda, and Tanganyika Territory. Its hosts include man, cattle, dog, leopard, *Procavia*, *Ichneumon*, *Aulacodus*, as well as the okapi (*Okapia johnstoni* Sclater: specimens obtained by Dr. H. Schouteden at Koteli, on the Itimbiri).

Ixodes pilosus C. L. Koch

Ixodes pilosus C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 233 (♀; South Africa); 1847, 'Uebersicht des Arachnidensystems,' IV, p. 105, Pl. XXI, fig. 79 (♀). Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 435, Pl. XVII, fig. 1, Pl. XVI*b*, fig. 6 (♂ ♀). Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 24 (♂ ♀). Nuttall and Warburton, 1911, 'Ticks, Part II, *Ixodes*,' p. 221, figs. 217–221, and p. 316 (♂ ♀, nymph and larva).

Tanganyika Territory.— Nyingwa, Uluguru Mts., several males and females off a duiker, *Cephalophus melanorheus schüsteri* Matschie, October 15, 1926 (Arthur Loveridge).

This tick is mainly South African and occurs on a variety of wild and domestic animals. In South Africa it is known as the "paralysis tick," because it produces paralysis in sheep. This disease is as yet of obscure etiology, but probably due to a toxin injected by the tick into the blood of the host. At any rate animals usually recover after the ticks have been removed.

Ixodes sp.

Nymphs of a species of *Ixodes* were collected by Mr. Arthur Loveridge, from the arm-pits of a golden mole, *Chrysochloris tropicalis* G. Allen and Loveridge, at Bagilo, Uluguru Mts., Tanganyika Territory, October 4, 1926 (recorded as mites by Allen and Loveridge, 1927, Proc. Boston Soc. Nat. Hist., XXXVIII, p. 419); also off a rodent, *Otomys kempi* Dollman, at Nyingwa, Uluguru Mts., Tanganyika Territory, October 18, 1926.

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[1] Hansen and Sörensen wrongly place Rio Benito in the "Congo," whereas it is on the Atlantic Coast, close to the southern border of Cameroon. There is no record of Ricinulei having ever been taken in the Congo Basin.

A hexapod larva and two nymphs of a species of *Ixodes* were found on a shrew, *Scutisorex congicus* Thomas, at Bumba, Belgian Congo, December 31, 1926; a nymph also on a tree squirrel, *Funisciurus pyrrhopus leonis* Thomas, at Lenga Town, Liberia, August 13, 1926, and off *Aethosciurus poensis musculinus* (Temminck) at Paiata, Liberia, October 1926.

The above records of larvae are of interest because they indicate the existence in Liberia of a species of *Ixodes*, a genus of ticks not yet reported from that country.

Six species of *Ixodes* are known from the Belgian Congo: *I. rasus* Neumann, *I. rubicundus* var. *limbatus* Neumann, *I. ugandanus* Neumann, *I. cavipalpus* Nuttall and Warburton, *I. daveyi* Nuttall, and *I. simplex* Neumann.

Amblyomma tholloni Neumann

Amblyomma tholloni Neumann, 1899, Mém. Soc. Zool. France, XII, p. 242 (♂ ♀; off elephant, Congo; Upper Ubangi; regions of Lake Nyasa and Lake Tanganyika); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 81 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 338. Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 249, figs. 123–124, Pl. VI, fig. 1 (♂ ♀).

LIBERIA.— Paiata, several males and females, off elephant, *Loxodonta africana cyclotis* (Matschie), together with *Dermacentor circumguttatus*, October 10, 1926.

BELGIAN CONGO.— Ingerosa near Irumu, several males and females, off *Loxodonta africana*, May 24, 1927 (R. P. Strong). Karibumba near Beni, off *Loxodonta africana*, March 21, 1927 (H. Coolidge). Semliki Forest, near old Beni, off *Loxodonta africana*, May 18, 1927 (R. P. Strong).

This appears to be the most widely distributed of the elephant ticks, being known from Sierra Leone, Liberia, Cameroon, Portuguese Congo, Belgian Congo, Uganda, Anglo-Egyptian Sudan, Tanganyika Territory and Nyasaland. Most of the large series seen by Robinson came from elephant; but he saw also specimens off a leopard, and Neumann lists the horse and an undetermined species of antelope among the hosts. In the Belgian Congo this tick is quite common (J. Schwetz, 1927, Rev. Zool. Afric., XV, 1, p. 92).

Amblyomma marmoreum C. L. Koch

Amblyomma marmoreum C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 224 (♂; South Africa). Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 78 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 338, fig. 45 (♂). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 86, figs. 38–39 (♂ ♀).

Amblyomma rugosum Neumann, 1899, Mém. Soc. Zool. France, XII, p. 253, fig. 55 (♂; Cape Colony and Congo).

Amblyomma devium Neumann, 1899, *loc. cit.*, p. 255 (♀) (not of Koch).

Amblyomma sparsum Neumann, 1899, *loc cit.*, p. 247 (♂; off *Spilotes variabilis* at the Paris Zoological Garden).

BELGIAN CONGO.— Ishasa River, one male and one female, off buffalo, *Syncerus caffer* (Sparrman), April 15, 1927 (R. P. Strong). Mai Ivwi, North of Ruchuru, two males and one female, off a snake, *Bitis arietans* (Merrem), March 31, 1927 (R. P. Strong).

Kenya Colony.— Ithanga Hills, near Lake Naivasha, several females and males, off buffalo, *Syncerus caffer* (Sparrman) (W. R. Zappey).

Amblyomma nuttalli Dönitz

Amblyomma nuttalli Dönitz, 1909, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 469, fig. 4 (♂ ♀; off turtles and *Varanus;* Daressalam and Bagamoyo, Tanganyika Territory; Umtali, Southern Rhodesia; and Cameroon). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 90, figs. 40–41 (♂ ♀).

Tanganyika Territory.— Kilosa, several males and one female, fixed on the sutures between the plates of the carapace of turtles, *Kinixys belliana* Gray, January 15 and 23, and March 1, 1921 (Arthur Loveridge).

Kenya Colony.— Mtoto Andei Station, one male off a lizard, *Agama agama caudospina* Meek (Arthur Loveridge).

The specimens from *Kinixys* were recorded under the name "*A. marmoreum*" by A. Loveridge (1923, Proc. Zool. Soc. London, p. 925). A careful study of Robinson's figures and descriptions and a comparison of specimens of the two species leaves no doubt that these turtle ticks belong to *A. nuttalli* and not to *A. marmoreum.* The two species, although closely allied, appear to be valid. The males differ markedly in the shape of the coxal spurs of the anterior (I) and posterior (IV) legs.

Amblyomma cuneatum Neumann

Amblyomma cuneatum Neumann, 1899, Mém. Soc. Zool. France, XII, p. 233 (♂; Congo); 1901, *loc. cit.*, XIV, p. 301 (♂ ♀; Togo and Cameroon); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 80 (♂ ♀). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 140, figs. 62–63 (♂ ♀).

Liberia.— Lenga Town, numerous males and females, many hexapod larvae, and one nymph, off an arboreal pangolin, *Uromanis longicaudata* (Brisson), August 21, 1926 (Glover Allen).

The presence of numerous hexapod larvae and one nymph indicates that this tick undergoes its complete life-cycle on the same host. It is apparently a common parasite of West African pangolins, although I have also seen specimens taken from the giant forest pig, *Hylochoerus meinertzhageni*, in the Belgian Congo. Most of the females and males which I collected on the pangolin were fixed upon the soft skin of the venter, near the anus.

Amblyomma variegatum (Fabricius)

Acarus variegatus Fabricius, 1798, 'Entom. Syst. Suppl.,' p. 572 (no sex; Africa).

Amblyomma variegatum Newstead, Dutton, and Todd, 1907, Ann. Trop. Med. Paras., I, p. 99. Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 82 (♂ ♀), fig. 37. Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 336, fig. 40 (♂). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 101, fig. 4 (on p. 9), Pl. II, figs. 1–4 (♂ ♀), and p. 289 (biology).

Ixodes elegans Guérin-Méneville, 1843, 'Iconogr. Règne Animal,' Arachn., p. 16, Pl. VI, fig. 1 (♂; Senegal and Egypt).

Amblyomma venustum C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 224 (♂; Senegal); 1847, 'Uebersicht des Arachnidensystems,' IV, p. 57, Pl. IX, fig. 31 (♂).

Belgian Congo.— Near Irumu, many males and females, off cattle, May 27, 1927 (R. P. Strong). Luvungi, abundant on cattle, January 30, 1927. Uvira, in grass.

This species is the common cattle tick throughout tropical and South Africa, Madagascar, Mauritius and Réunion. It has been introduced into the West Indies and Central America. It is quite common in the Belgian Congo (J. Schwetz, 1927, Rev. Zool. Afric., XV, 1, p. 91). The known hosts include many wild and domestic animals. G. A. H. Bedford (1920, Jl. Dept. Agric. Union South Africa, July, p. 20 of reprint) states that he found by experiments that this tick can transmit heartwater of goats, a disease probably caused by *Rickettsia ruminantium* Cowdry.

Amblyomma cohaerens Dönitz

Amblyomma cohaerens Dönitz, 1909, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 465 (♂; East Africa). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 337. Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 107, fig. 46 (♂ ♀).

Amblyomma anceps Dönitz, 1909, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 466 (♂; Lake Tanganyika).

Belgian Congo.— Bungulu (new Beni), Ituri Forest, one male and one female, off buffalo, *Syncerus caffer* (Sparrman), May 13, 1927 (R. P. Strong). Ishasa River, several males and one female, off buffalo, April 15, 1927 (R. P. Strong). Mai Ivwi, Ruchuru Plains, off buffalo, March 3, 1927 (H. Coolidge).

This is the usual tick of East African buffalo.

Amblyomma gemma Dönitz

Amblyomma gemma Dönitz, 1909, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 458 (♂ ♀; Mkatta Steppe, Tanganyika Territory). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 119, Pl. I, figs. 3 and 5; Pl. IV, fig. 3; text-fig. 52 (♂ ♀).

Kenya Colony.— Ithanga Hills, near Lake Naivasha, one male and one female, off buffalo, *Syncerus caffer* (Sparrman) (W. R. Zappey).

Amblyomma splendidum Giebel

Amblyomma splendidum Giebel, 1877, Zeitschr. Ges. Naturwiss., XLIX, p. 295 (♂ ♀; Gaboon, off buffalo). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 336, figs. 41–42 (♂ ♀). Robinson, 1926, 'Ticks, Part IV, *Amblyomma*,' p. 123, Pl. II, figs. 5–6, Pl. IV, fig. 2 (♂ ♀).

Amblyomma hebraeum splendidum Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 80 (♂ ♀). Newstead, Dutton, and Todd, 1907, Ann. Trop. Med. Paras., I, p. 99 (♂ ♀).

Amblyomma quantini Martin, 1895, Ann. Sci. Nat. Zool., (7) XVIII, p. 267, Pl. XIV, figs. 1–11 (♂ ♀; off *Syncerus brachyceros;* French Congo).

Liberia.— Miamu, several males and females, off bush-cow, *Syncerus nanus* (Boddaert), August 13, 1926.

Belgian Congo.— Kindu, off buffalo.

This is the usual West African buffalo tick.

Four species of *Amblyomma* are known with certainty from Liberia: *A. tholloni* Neumann, *A. cuneatum* Neumann, *A. splendidum* Giebel, and *A. paulopunctatum* Neumann (*A. trimaculatum* Neumann; female first described from Robertport, Liberia). Neumann (1901, Mém. Soc. Zool. France, XIV, p. 306) states that he saw, in the collections of the Berlin Museum, specimens of *A. petersii* Karsch, labelled "Liberia." As this tick is otherwise known from eastern tropical Africa only, the locality label must have been due to an error. Neumann (1913, 'Voy. Alluaud et Jeannel Afr. Orient., Rés. Scientif., Arachnides, II, Ixodidae,' p. 29) also mentions incidentally that *Amblyomma crenatum* Neumann has been recorded from Liberia, off *Rhinoceros bicornis*. Since there is no rhinoceros in Liberia, the occurrence there of *A. crenatum* is highly improbable.

In the Belgian Congo the genus *Amblyomma* is represented by eleven species: *A. pomposum* Dönitz (found on hartebeest, eland, roan and sable antelopes, and zebra, in Katanga), *A. variegatum* (Fabricius), *A. cohaerens* Dönitz, *A. eburneum* Gerstaecker (specimens in the Congo Museum, which I collected off buffalo at Kongolo, were identified as that species by Gedoelst), *A. paulopunctatum* Neumann (collected at Medje by H. Lang and J. P. Chapin), *A. splendidum* Giebel, *A. cuneatum* Neumann, *A. tholloni* Neumann, *A. marmoreum* Koch, *A. nuttalli* Dönitz (found on a turtle, *Kinixys belliana* Gray, at Mahagi, by Dr. H. Schouteden), and *A. petersii* Karsch (on rhinoceros, probably in the Lulua district; the locality Misisi River is in Uganda, not in the Belgian Congo). Nuttall (1916, Bull. Ent. Res., VI, 4, p. 337, fig. 43) and Schwetz (1927, Rev. Zool. Afric., XV, 1, p. 91) also list *A. hebraeum* Koch, which is, however, an East and South African species not likely to be found in the Belgian Congo. The specimens recorded as that species from Boma and the Upper Congo, most probably were *A. splendidum*.

Nymphs and larvae of undetermined species of *Amblyomma* were collected in the Belgian Congo from the following hosts: waterbuck, *Kobus defassa* Rüppell, Mai Ivwi, near Ruchuru; topi, *Damaliscus korrigum jimela* Matschie, Ishasa River; and bushbuck, *Tragelaphus scriptus* (Pallas), Ruchuru River; also off a squirrel, *Euxerus erythropus maestus* Thomas, at Paiata, Liberia. Mr. A. Loveridge found hexapod larvae of this genus on a baboon, *Papio cynocephalus* (Linnaeus), at Kilosa, Tanganyika Territory.

Aponomma exornatum (C. L. Koch)

Amblyomma exornatum C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 231 (♂ ♀; Christmas Bay, South Africa).

Aponomma exornatum Neumann, 1899, Mém. Soc. Zool. France, XII, p. 186, fig. 40 (♂ ♀); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 94 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 339, fig. 47 (♀). Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 448 (♂ ♀).

Ixodes flavomaculatus H. Lucas, 1846, Ann. Soc. Ent. France, (2) IV, p. 56, Pl. 1, figs. 1–1*a* (♂ ♀; off a *Python* from Senegal).

Ixodes varani R. T. Lewis, 1892, Jl. Quekett Micr. Club, (2) V, p. 14, Pl. 1, figs. 1–8 (♂; Natal, off *Varanus*).

TANGANYIKA TERRITORY.— Amani, Usambara Mts., several males, females, and nymphs, off a female *Varanus niloticus* (Linnaeus), November 29, 1926 (Arthur Loveridge). Kilosa, off the same host, March 25, 1921, and off *Varanus exanthemicus ocellatus* Rüppell, May 12, 1922 (Arthur Loveridge).

Aponomma laeve Neumann

Aponomma laeve Neumann, 1899, Mém. Soc. Zool. France, XII, p. 190 (♂ ♀; Patagonia, Amonzette (?), and off *Dasypeltis fasciolata* at Banana, Belgian Congo); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 95 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 339.

LIBERIA.— Paiata, one male and one female, off a snake, *Dendraspis viridis* (Hallowell), October 13, 1926 (D. Linder).

BELGIAN CONGO.—Mai Ivwi, north of Ruchuru, one female, off a snake, *Bitis arietans* (Merrem), March 31, 1927 (R. P. Strong), together with *Amblyomma marmoreum*.

TANGANYIKA TERRITORY.— Zengeragusu, forty miles from Mkalama, off a snake, *Dasypeltis scaber* (Linnaeus) [“this snake was literally covered with ticks, seventy-five of which I collected” (A. Loveridge, 1923, Proc. Zool. Soc. London, p. 881)], November 3, 1921 (Arthur Loveridge). Kilosa, off *Rhamphiophis oxyrhynchus* Reinhard, May 20, 1923 (Arthur Loveridge).

Two species of the genus *Aponomma* occur in the Belgian Congo: *A. exornatum* and *A. laeve*. Only *A. laeve* is known thus far from Liberia.

Hyalomma aegyptium albiparmatum P. Schulze

Hyalomma aegyptium albiparmatum P. Schulze, 1919, Sitzungsber. Ges. Naturf. Fr. Berlin, pp. 194 and 196 (♂ ♀; Tanganyika Territory, without more definite locality). Chodziesner, 1924, Zool. Jahrb., Abt. Syst., XLVII, p. 553 (♂ ♀).

Hyalomma aegyptium Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, Pl. XVI*a*, fig. 4 (♂). (Not *Acarus aegyptius* Linnaeus).

KENYA COLONY.— Ithanga Hills, near Lake Naivasha, several males and females, off buffalo, *Syncerus caffer* (Sparrman) (W. R. Zappey).

I have followed Miss Margot Chodziesner's recent revision of the genus *Hyalomma* in referring these specimens to the subspecies *albiparmatum*.[1] I am, however, by no means satisfied that the distinction between *H. a. albiparmatum* and *H. a. impressum* Koch is based upon more than individual variation; it is probably not of subspecific significance. In the lot from Ithanga most males have a white spot on the “parma,” or median dorsal festoon, but others lack this spot.

According to Miss Chodziesner, *H. a. albiparmatum* was known only from Tanganyika Territory, although she lists it also from Ruanda, which is now part of the Belgian Congo. *Hyalomma aegyptium* has also been recorded from several other localities in the Belgian Congo (Kasongo; Mandoko; Kamima, Lomami; and Elisabethville). Probably all these specimens belonged to the subspecies *H. a. albiparmatum*, which I have recognized in a lot from Mandoko. Miss Chodziesner identified as *H. a. impressum* specimens collected by v. Falkenstein at Chinchoxo, at the mouth of the Shiloango River, in the Portuguese territory of Cabinda.[2]

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[1] Chodziesner, Margot 1924. 'Beiträge zur Kenntnis der Zecken mit besonderer Berücksichtigung der Gattung *Hyalomma* Koch.' Zool. Jahrb., Abt. Syst., XLVII, pp. 505–572, Pl. VII (map).

[2] Chinchoxo lies in 5° 15′ lat. S. and 12° 15′ long. E. and is not in the Gaboon, where Miss Chodziesner places it on her map. *Hyalomma aegyptium* is a species of the savanna and there is no evidence that it has ever been found in the West African rain forest.

Hyalomma pusillum P. Schulze

Hyalomma pusillum P. Schulze, 1919, Sitzungsber. Ges. Naturf. Fr. Berlin, pp. 193 and 195 (♂ ♀; Arabia). Chodziesner, 1924, Zool. Jahrb., Abt. Syst., XLVII, p. 560, fig. T[1] (♂ ♀ and nymph).

Southern Arabia.— Aden, many males and females, off dromedary, *Camelus dromedarius* Linnaeus, May 9, 1927 (J. Bequaert). These specimens were obtained in the type locality of the species.

Only one species of *Hyalomma* (*H. aegyptium*) is known from the Belgian Congo and none from Liberia. *Hyalomma* (*Cosmiomma*) *hippopotamense* (Denny), a specific parasite of the hippopotamus, should be looked for in both territories.[1]

Rhipicephalus sanguineus (Latreille)

Ixodes sanguineus Latreille, 1806, 'Gen. Crust. Ins.,' I, p. 157 (France).

Rhipicephalus sanguineus Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 469, Pl. XVI*b*, fig. 10, Pl. XVII, fig. 6 (♂ ♀). Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 35, figs. 16–17 (♂ ♀). Newstead, Dutton, and Todd, 1907, Ann. Trop. Med. Paras., I, p. 100. Cunliffe, 1914, Parasitology, VI, pp. 372–378, figs. 1–4 (♂ ♀, larva, and nymph). Nuttall, 1915, Parasitology, VII, p. 448 (biology); 1916, Bull. Ent. Res., VI, 4, pp. 328 and 345, figs. 25–28 (♂ ♀). J. Bequaert, 1926, Medical Rept. Hamilton Rice 7th Exp. Amazon, p. 168. Senevet, 1928, Arch. Inst. Pasteur Algérie, VI, p. 46, fig. (on p. 45) (larva).

Liberia.— Reppo's Town and Lenga Town, many males and females, off domestic dog, August 13 and 31, 1926.

Belgian Congo.— Stanleyville, off domestic dog, January 1927.

R. sanguineus is the common dog tick, now almost of world-wide distribution in tropical and subtropical regions. In Africa practically every dog is infested with it and it is found on many other animals, both wild and domestic. A remarkable host record is the okapi (*Okapia johnstoni* Sclater), based upon specimens obtained by Schouteden at Koteli, Itimbiri.

As shown by Christophers, *R. sanguineus* is the carrier in dogs of *Hepatozoon canis* (James), a parasite of the leucocytes, and of *Babesia canis* (Piana and Galli-Valerio), a parasite of the red blood corpuscles. *Babesia canis* is the cause of malignant jaundice of dogs, a disease widely distributed in the Old World. It is not quite clear yet that *Hepatozoon canis* is pathogenic to any great extent.

Rhipicephalus appendiculatus Neumann

Rhipicephalus appendiculatus Neumann, 1901, Mém. Soc. Zool. France, XIV, p. 270 (♂ ♀; Cape Colony and Southwest Africa); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 37 (♂ ♀). Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 470, Pl. XVI*b*, figs. 7 and 14, and Pl. XVII, fig. 7 (♂ ♀). Nuttall, 1913, Parasitology, VI, pp. 111–117 (biology); 1915, *loc. cit.*, VII, p. 438; 1916, Bull. Ent. Res., VI, 4, pp. 323 and 344, figs. 18–21 (♂ ♀).

Rhipicephalus nitens Neumann, 1904, Arch. de Parasitologie, VIII, p. 462 (♂ ♀; Stellenbosch, Cape Province). Newstead, Dutton, and Todd, 1907, Ann. Trop. Med. Paras., I, p. 100 (♂ ♀).

Belgian Congo.— Uvira, two males and one female, in grass, January 1927. Kamaniola, one male, in grass. Kisenyi, three males, in grass, February 12, 1927.

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[1] In his diary, Dr. R. P. Strong notes having taken ticks from a hippopotamus killed at the Ruchuru River, south of Lake Edward. Unfortunately the specimens in question have been mislaid.

Tanganyika Territory.— Kigoma, one male, in grass, January 24, 1927.

According to J. Marcq (1924, Ann. Gembloux, XXX, 1, pp. 1–40), *R. appendiculatus* is the most common cattle tick in Ruanda, where it appears to be the carrier of African East Coast fever, caused by *Theileria parva* (Theiler). Van Saceghem (1925, Bull. Agric. Congo Belge, XVI, pp. 582–591) claims that, owing to the low temperature especially at night, East Coast fever does not spread among cattle above the altitude of 2500 m. in Ruanda. In South Africa the disease is generally transmitted by *R. appendiculatus;* but other species of the same genus, such as *R. simus*, *R. evertsi*, and *R. capensis*, may also act as vectors.

Rhipicephalus longus Neumann

Rhipicephalus longus Neumann, 1907, Ann. Trop. Med. Paras., I, p. 117, figs. 24–25 (♂; Kasongo, Belgian Congo); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 36 (♂).

Rhipicephalus falcatus Neumann, 1908, Notes Leyden Mus., XXX, p. 77, fig. 4 (♂ ♀; north of Lake Nyasa and Liberia). Warburton, 1912, Parasitology, V, p. 20. Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 327, fig. 23 (♂).

Belgian Congo.— Southwest of Bungulu (new Beni), Ituri Forest, many males and females, off buffalo, *Syncerus planiceros* (Blyth), May 13, 1927 (R. P. Strong).

As Warburton has shown, the type of *R. longus* was a somewhat ill-characterized male of *R. falcatus*. The name *R. longus* antedates, however, that of *R. falcatus* and must be retained for the species.

Rhipicephalus simus C. L. Koch

Rhipicephalus simus C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 238 (♂; South Africa). C. W. Howard, 1908, Ann. Transvaal Mus., I, 2, p. 132, Pl. VIII, fig. *f;* Pl. IX, fig. *f;* Pl. X, figs. *f* and *i;* Pl. XI, figs. *c*, *f*, and *h* (♂ ♀, nymph, larva, and egg). Newstead, Dutton, and Todd, 1907, Ann. Trop Med. Paras., I, p. 100 (♂ ♀). Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 473, Pl. XVI*b*, fig. 15 (♂ ♀). Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 37 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, pp. 331 and 345, fig. 29 (♂ ♀).

Rhipicephalus senegalensis C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 238 (♀; Senegal and Egypt).

Rhipicephalus praetextatus Gerstaecker, 1873, in v. d. Decken's 'Reisen in Ost-Afrika,' III, 2, Gliederthiere, p. 468 (♂; Mombasa).

Rhipicephalus perpulcher Gerstaecker, 1873, in v. d. Decken's 'Reisen in Ost-Afrika,' III, 2, Gliederthiere, p. 469 (♀; Mombasa).

Belgian Congo.— Ruchuru Plains, several males and females, off wart-hog, *Phacochoerus africanus* (Gmelin), April 5, 1927 (R. P. Strong), and off buffalo, *Syncerus caffer* (Sparrman), March 3, 1927 (H. Coolidge).

Tanganyika Territory.— Sagayo, Mwanza, several males and females, off a civet cat, *Civettictis civetta orientalis* Matschie (Arthur Loveridge). Kilosa off leopard, *Felis pardus suahelicus* Neumann, and off a genet, *Genetta suahelica* Matschie (Arthur Loveridge).

R. simus is one of the more widely distributed species of the genus, occurring all over Africa, from Egypt and the Senegal to the Cape. It has a variety of hosts and is often found on domestic animals. J. Schwetz (1927, Rev. Zool. Afric., XV, 1, p. 89) lists it from several localities in the Belgian Congo.

In South Africa, this is one of the ticks conveying East Coast fever, a disease of cattle caused by the blood parasite *Theileria parva* (Theiler) (see under *R. appendiculatus*).

Rhipicephalus sulcatus Neumann

Rhipicephalus sulcatus Neumann, 1908, Bull. Mus. Hist. Nat. Paris, p. 352, figs. 1–2 (♂♀; "Congo"; probably French Congo).

Belgian Congo. — Mai Ivwi, in the Ruchuru Plains, off buffalo, *Syncerus caffer* (Sparrman), March 3, 1927 (H. Coolidge). Kindu, off forest buffalo. Kasongo, without host.

These specimens all agree quite well with Neumann's description and figures; yet I have my doubts as to whether *R. sulcatus* and *R. capensis* are specifically distinct. J. Schwetz (1927, Rev. Zool. Afric., XV, I, p. 84) has recorded *R. sulcatus* from Tshisika and a female of that lot, which I have seen, seems to belong to this species. *R. sulcatus* is known only from the Congo.

Rhipicephalus deltoideus Neumann

Rhipicephalus deltoideus Neumann, 1910, Tijdschr. v. Entom., LIII, p. 13, Pl. 1, figs. 3–7 (♂♀; Basutoland).

Belgian Congo. — Ishasa River, several males and females, off a wild rabbit, *Lepus* sp., April 13, 1927 (G. C. Shattuck).

The host of this little-known species does not appear to have been recorded thus far.

Rhipicephalus capensis compositus Neumann

Rhipicephalus compositus Neumann, 1897, Mém. Soc. Zool. France, X, p. 393 (♂; Khartoum and Tanganyika Territory).

Rhipicephalus capensis compositus Neumann, 1905, Arch. de Parasitologie, IX, p. 231 (♂♀); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 39 (♂♀).

Belgian Congo.— Ruchuru Plains, off warthog, *Phacochoerus africanus* (Gmelin), April 5, 1927 (R. P. Strong).

I am inclined to suspect that this form of *R. capensis* was described anew by Warburton, as *R. neavei* var. *punctatus* (1912, Parasitology, V, p. 10, figs. 4–5).

Rhipicephalus cuneatus Neumann

Rhipicephalus cuneatus Neumann, 1908, Notes Leyden Mus., XXX, p. 76, figs. 2–3 (♂; off cattle, Ngomo on the Ogowe River, Gaboon).

Liberia.— Sessu Town, one male, off a monkey, October 5, 1926 (L. Whitman).

This specimen agrees in every detail with the original description and figures. I have my doubts, however, as to the specific distinctness of *R. cuneatus* and *R. ziemanni* Neumann (1904, Arch. de Parasitologie, VIII, p. 464; ♂♀; off cattle, Cameroon). The latter has also been recorded from Liberia by Neumann; but since it has not been figured, I hesitate to unite the two species.

Rhipicephalus aurantiacus Neumann

Rhipicephalus aurantiacus Neumann, 1907, Notes Leyden Mus., XXIX, p. 90, figs. 3–4 (♂ ♀; Liberia); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 41 (♂ ♀).

LIBERIA.— Miamu, several females and males, off bush-cow, *Syncerus nanus* (Boddaert), August 31, 1926. Moala, off leg of man, November 1, 1926.

This tick is known from Liberia and the Belgian Congo (Medje).

Rhipicephalus pulchellus (Gerstaecker)

Dermacentor pulchellus Gerstaecker, 1873, in v. d. Decken's 'Reisen in Ost-Afrika,' III, 2, Gliederthiere, p. 467, Pl. XVIII, fig. 2 (♂; Aruscha, Uru and Lake Jipe, Tanganyika Territory).

Rhipicephalus pulchellus Neumann, 1897, Mém. Soc. Zool. France, X, p. 399, figs. 33–34 (♂ ♀); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 43, fig. 23 (♂ ♀). Warburton, 1912, Parasitology, V, p. 17. Cunliffe, 1913, *loc. cit.*, VI, pp. 204–216, figs. 3–6 (♂ ♀).

Rhipicephalus marmoreus Pocock, 1900, Proc. Zool. Soc. London, p. 50, Pl. III, figs. 1-1*d* (♂; Bularli, West Somaliland).

Rhipicephalus maculatus Neumann, 1901, Mém. Soc. Zool. France, XIV, p. 273 (♀; not the ♂).

TANGANYIKA TERRITORY.— West side of Mt. Longido, several males, without host, January 11, 1916 (Arthur Loveridge). I have also seen specimens obtained off zebra in East Africa.

KENYA COLONY.— Ithanga Hills, near Lake Naivasha, several males and females, off buffalo, *Syncerus caffer* (Sparrman) (W. R. Zappey.)

This tick appears to be restricted to Northeastern Africa (Abyssinia, Uganda, Kenya Colony, Somaliland, Zanzibar, and Tanganyika Territory), where it is known from a variety of hosts.

Rhipicephalus plumbeus (Panzer)

Acarus plumbeus Panzer, 1795, 'Fauna Insect. Germanica,' Fasc. 90, Pl. XXII (nymph; off *Alauda trivialis*, Germany).

Rhipicephalus plumbeus Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 46 (nymph).

Rhipicephalus sp.? Neumann, 1897, Mém. Soc. Zool. France, X, p. 414, fig. 43 (nymph).

LIBERIA.— Banga, several nymphs off a yellow wagtail, *Budytes flavus* (Linnaeus), October 24, 1926.

This tick occurs frequently as nymph on a variety of birds in Europe and North Africa. Its occurrence in West Africa is evidently due to the migrating habits of the wagtails. Kelso (1903, The Zoologist, LXI, p. 155) records a wagtail, caught on board ship in the Red Sea, with several ticks attached to its head. The specimens which I collected were attached to the side of the neck, where they caused a marked inflammation of the skin. The adult stage of this tick is as yet unknown, but is perhaps *Rhipicephalus bursa* Canestrini and Fanzago, which has slightly projecting, hemispherical eyes.

Only six species of *Rhipicephalus* are at present known from Liberia: *R. sanguineus* (Latreille), *R. ziemanni* Neumann, *R. longus* Neumann, *R. cuneatus* Neumann, *R. aurantiacus* Neumann, and *R. plumbeus* (Panzer). In the Belgian Congo, however, the genus is abundantly represented by some seventeen species: *R. appendiculatus* Neumann, *R. aurantiacus* Neumann, *R. bursa* Canestrini and Fanzago, *R. capensis* C. L. Koch (with var. *compositus* Neumann), *R. com-*

planatus Neumann (*R. planus* Neumann), *R. duttoni* Neumann, *R. dux* Dönitz (*R. schwetzi* Larrousse), *R. evertsi* Neumann (with var. *mimeticus* Dönitz = *albigeniculatus* Warburton), *R. longus* Neumann (*R. falcatus* Neumann), *R. sanguineus* (Latreille) (with var. *punctatissimus* Gerstaecker), *R. simpsoni* Nuttall, *R. simus* C. L. Koch (with var. *lunulatus* Neumann and var. *shipleyi* Neumann), *R. sulcatus* Neumann, *R. supertritus* Neumann (*R. coriaceus* Nuttall and Warburton), *R. deltoideus* Neumann, *R. neavei* Warburton, and *R. tricuspis* Dönitz.

Boophilus decoloratus (C. L. Koch)

Rhipicephalus decoloratus C. L. Koch, 1844, Arch. f. Naturgesch., X, 1, p. 239 (♀; South Africa). C. Fuller, 1899, Queensland Agric. Jl., IV, pp. 389–394, fig. 3.

Rhipicephalus annulatus var. *decoloratus* Neumann, 1901, Mém. Soc. Zool. France, XIV, p. 279 (♂ ♀).

Boophilus decoloratus Stiles and Hassall, 1901, Circ. 34, Bur. An. Industry, U. S. Dept. Agric., p. 3. Salmon and Stiles, 1902, 17th Ann. Rept. Bur. An. Industry, U. S. Dept. Agric. (1900), p. 433 (♂ ♀), figs. 152, 152*c*, 154*d*, and 155. Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 459 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, pp. 333 and 345, figs. 35–36 (♂ ♀).

Margaropus annulatus decoloratus Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 48 (♂ ♀).

Margaropus annulatus var. *decoloratus* C. W. Howard, 1908, Ann. Transvaal Mus., I, 2, p. 107, Pl. VI, figs. *a*-*o* (♂ ♀, nymph and larva).

Belgian Congo.— Near Irumu, two females, off cattle, May 27, 1927 (R. P. Strong). Luvungi, one female, off cattle, January 30, 1927.

This is a widely distributed species in tropical and South Africa. There are many records from the Belgian Congo (J. Schwetz, 1927, Rev. Zool. Afric., XV, 1, p. 91), where it appears to be the most common cattle tick. Schwetz also lists two records of "*Margaropus annulatus*" for cattle in the Belgian Congo, after specimens in the Congo Museum identified by Neumann and Gedoelst. If critically examined, these specimens, as well as those recorded by Newstead, Dutton and Todd (1907, Ann. Trop. Med. Paras., I, p. 100), will certainly prove to be *B. decoloratus* and not the North American *B. annulatus* (Say). The same remark applies to Newstead, Dutton and Todd's record of the var. *calcaratus*.

B. decoloratus is a tick of great economic significance. In Africa, it transmits several important diseases of domestic animals: redwater or Texas fever, due to *Babesia bigemina* (Smith and Kilborne), in cattle; gall-sickness, caused by *Anaplasma marginale* Theiler, in cattle; and spirochaetosis of cattle, sheep, and horses, due to *Treponema theileri* (Laveran).

Boophilus decoloratus is the only species of the genus found in the Belgian Congo. It has not yet been reported from Liberia.

Dermacentor rhinocerinus (Denny)

Ixodes rhinocerinus H. Denny, 1843, Ann. Mag. Nat. Hist., XII, p. 313, Pl. XVII, fig. 3 (♂; off *Rhinoceros bicornis*, South Africa).

Dermacentor rhinocerinus Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 483, Pl. XV, fig. 8 and Pl. XVII, fig. 14 (♂ ♀).

Dermacentor rhinocerotis Gerstaecker, 1873, in v. d. Decken's 'Reisen in Ost-Afrika, III, 2, Gliederthiere,' p. 466 (♂ ♀). Neumann, 1897, Mém. Soc. Zool. France, X, p. 370, figs. 25–26 (♂ ♀);

1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 102, fig. 48 (♂ ♀). C. W. Howard, 1908, Ann. Transvaal Mus., I, 2, p. 157, Pl. XVI, figs. *o-p* (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 321, figs. 14–15 (♂ ♀) (Not *Acarus rhinocerotis* de Geer).

Belgian Congo.— Northeastern Uele, several males and females, off white rhinoceros, *Ceratotherium simum cottoni* Lydekker (J. Rodhain). These specimens are part of a lot identified by Professor Nuttall as *D. rhinocerinus*, in the collections of the Congo Museum at Tervueren. They are colored like the typical form of the species.

Tanganyika Territory.— West side of Mt. Longido, January 11, 1916, without host (Arthur Loveridge).

Dermacentor circumguttatus Neumann

Dermacentor circumguttatus Neumann, 1897, Mém. Soc. Zool. France, X, p. 374, fig. 27 (♂ ♀; Congo and Upper Ubangi); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 102 (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 321, fig. 13 (♂ ♀).

Liberia.— Paiata, one male and two females, off elephant, *Loxodonta africana cyclotis* (Matschie).

Belgian Congo.— Ingerosa near Irumu, one male, off *Loxodonta africana*, May 24, 1927 (R. P. Strong). Semliki Valley, near old Beni, off elephant, May 18, 1927 (R. P. Strong). Karibumba near Beni, off *Loxodonta africana*, March 21, 1927 (H. Coolidge).

This tick is known from many localities in the Belgian Congo (J. Schwetz, 1927, Rev. Zool. Afric., XV, 1, p. 91). It appears to be strictly West African and much less widely distributed than the other elephant tick, *Amblyomma tholloni*.

Of *Dermacentor*, only one species (*D. circumguttatus*) is known from Liberia. Two occur in the Belgian Congo: *D. circumguttatus* and *D. rhinocerinus*.

The genus *Rhipicentor* seems to be more closely related to *Dermacentor* than to *Rhipicephalus*. Only one species has been found in the Belgian Congo: *R. gladiger* (Neumann) (*Rhipicephalus gladiger* Neumann = *Rhipicentor bicornis* Nuttall and Warburton). None has as yet been reported from Liberia.

Haemaphysalis parmata Neumann

Haemaphysalis parmata Neumann, 1905, Arch. de Parasitologie, IX, p. 228 (♂ ♀; off cattle, sheep, goat and pig, Cameroon); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 109 (♂ ♀). Nuttall and Warburton, 1915, 'Ticks, Part III, *Haemaphysalis*,' p. 418, figs. 350–353 (♂ ♀, nymph and larva). Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 320, figs. 11–12 (♂ ♀).

Belgian Congo.— Ruchuru Plains, several females off bushbuck, *Tragelaphus scriptus* (Pallas), April 4, 1927 (R. P. Strong). Bumba, one male off *Dorcatherium aquaticum cottoni* Lydekker, January 6, 1927.

There are several previous records of this species from the Belgian Congo (Kasongo; Kimaka; Beni; and Kibombo).

Haemaphysalis leachii (Audouin)

Ixodes leachii Audouin, 1827, in Savigny, 'Descr. de l'Egypte,' 2d Ed., XXII, Zool., p. 428 (♂; Egypt); [1826, Atlas, Pl. IX, fig. 9; without name].

Haemaphysalis leachi Neumann, 1897, Mém. Soc. Zool. France, X, p. 347, figs. 13–15 (♂ ♀); 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 114, figs. 62 and 63 (♂ ♀). Nuttall and Warburton, 1915, 'Ticks, Part III, *Haemaphysalis*,' p. 460, figs. 398–410, Pls. XII and XIII (♂ ♀). Nuttall, 1916, Bull. Ent. Res., VI, 4, pp. 319 and 343, figs. 9–10 (♂ ♀).
Opisthodon canestrinii Supino, 1897, Atti Soc. Veneto-Trent. Sci. Nat., Padova, (2) III, (1898), p. 252, Pl. XIII, fig. 21 (♂).
Opisthodon gestroi Supino, 1897, *loc cit.*, p. 252, Pl. XIII, fig. 23 (♀).
Opisthodon asiaticus Supino, 1897, *loc. cit.*, p. 252, Pl. XIII, fig. 22 (♂).
Haemaphysalis leachi australis Neumann, 1905, Arch. de Parasitologie, IX, p. 238 (♂ ♀; Sumatra and New South Wales).
Haemaphysalis koningsbergeri Warburton and Nuttall, 1909, Parasitology, II, p. 65, figs. 11 and 12 (♂ ♀; off *Felis pardus*, without locality).
Haemaphysalis leachi var. *indica* Warburton, 1910, Parasitology, III, p. 402 (♂ ♀; off *Canis aureus*, Calcutta, India).

LIBERIA.— Gbanga, several males and females, off the ears, eyelids and face of *Crossarchus obscurus* F. Cuvier, September 16, 1926; and off *Civettictis civetta* (Schreber), September 5, 1926. Du River (Camp No. 3), one male, off domestic cat, *Felis domestica*, August 1, 1926 (M. Theiler).

BELGIAN CONGO.— Upoto, two males, fixed between the toes of a mongoose, *Atilax* (? *paludinosus robustus*), December 30, 1926. Kisenyi, on the northern shore of Lake Kivu, one female, off domestic dog, *Canis familiaris*, February 13, 1927. Ruchuru, several males and females, off *Galerella brunneo-ochracea* Matschie, February 28, 1927. Ruchuru Plains, several males and one female, off lion, *Felis leo* Linnaeus, April 1927 (R. P. Strong). Lulenga, several males and females, off *Civettictis civetta* (Schreber), March 6, 1927.

TANGANYIKA TERRITORY.— Kilosa, several males and females off *Genetta suahelica* Matschie, about December 24, 1922; off *Felis pardus suahelicus* Neumann, January 21, 1923; and off *Felis capensis hindei* Wroughton, March 22, 1922 (Arthur Loveridge). Mkata River, several males and females, off *Genetta suahelica* Matschie, August 25, 1921 (Arthur Loveridge). Sagayo, Mwanza, several males, off *Civettictis civetta orientalis* Matschie, November 4, 1923 (Arthur Loveridge).

A common parasite of wild Carnivora and domestic dog and cat, over the whole of Africa, southern Asia, the Malay Archipelago and Australia. There are many records from the Belgian Congo (J. Schwetz, 1927, Rev. Zool. Afric., XV, 1, p. 89). A detailed account of this tick and its biology is found in Nuttall and Warburton's Monograph (1915). It is of considerable economic importance as the usual carrier of canine piroplasmosis, a fatal disease of dogs caused by *Babesia canis* (Piana and Galli-Valerio). (See under *Rhipicephalus sanguineus.*)

Only one species of *Haemaphysalis* (*H. leachii*) is known at present in Liberia. Two species (*H. leachii* and *H. parmata*) are found in the Belgian Congo. J. Schwetz (1927, Rev. Zool. Afric., XV, 1, p. 89) also lists a "*H. eurysternus*," from the Lualaba, after specimens named by Gedoelst, in the collections of the Congo Museum. A species of *Haemaphysalis* bearing that name is not known to me, and the record was based upon specimens of the cattle louse, *Haematopinus eurysternus* (Nitzsch).

ARGANTIDAE

(*Argasidae*)

Ornithodoros moubata (Andr. Murray)

Argas moubata Andr. Murray, 1877, 'Economic Entomology, Aptera,' I, p. 182, fig. (Angola).

Ornithodoros moubata Neumann, 1911, 'Das Tierreich, Lief. 26, Acarina, Ixodidae,' p. 123. Nuttall and Warburton, 1908, 'Ticks, Part I, Argasidae,' p. 46, figs. 58 and 66–80, and pp. 96-101 (♂ ♀, nymph, larva, egg). Dönitz, 1910, Denkschr. Med.-Naturw. Ges. Jena, XVI, p. 415.

Ornithodoros savignyi var. *caecus* Neumann, 1901, Mém. Soc. Zool. France, XIV, p. 256 (from many African localities).

Ornithodorus moubata Nuttall, 1916, Bull. Ent. Res., VI, 4, p. 315, fig. 4 (♀). Cunliffe and Nuttall, 1921, Parasitology, XIII, pp. 327–347, Pl. XVI (♂ ♀).

BELGIAN CONGO.— Uvira; Irumu; Ruchuru. Common in huts and rest-houses. According to Dr. Lejeune, it also exists in the region of Albertville.

TANGANYIKA TERRITORY.— Mdjengo's, Singida; and Bukoba (Arthur Loveridge).

From a medical point of view, *Ornithodoros moubata* is the most important tick of Africa, since it is the carrier of a blood spirochaete, *Treponema duttoni* (Novy and Knapp), which causes African relapsing fever, an extremely dangerous human disease. In tropical Africa the distribution of the tick coincides with that of the disease, since most of the specimens are infected with the spirochaete, which is transmitted within the eggs of the tick. In localities where the tick occurs, the adult natives generally are immune against the disease, but newcomers when bitten hardly ever fail to contract the fever.

There can be little doubt that *O. moubata* was originally a tick of the arid and semi-arid regions of East Africa, where it still occurs in the open (as observed by Brumpt and others), travelling over the soil even in mid-day, and where it also inhabits the burrows of various animals, especially of warthog.[1] From East Africa it appears to have been carried westward and southward by man (especially by the East African Arab traders), its migrations being aided probably by the present general tendency toward desiccation of tropical Africa. Moreover, over much of its present area it is found as a rule in native buildings only, where it is protected against excessive humidity. Cunliffe (1921) has shown experimentally that an excess of moisture is decidedly unfavorable to the vitality of this tick. As indicated on the accompanying map, it has hardly entered the West African and Congo rain forest, where it occurs only in a few of the larger clearings of the Ituri Basin.[2] It is difficult, from published information, to trace its southern and northwestern limits. There are definite locality records from northern Zululand (C. Fuller, 1924) and Namaqualand (between Narubis and Hasuur, in about 27° lat. S., according to Trommsdorff, 1914), and that it exists in Bechuanaland, Orange Free State, and northern Transvaal is beyond doubt; but I find no record of its occurrence south of

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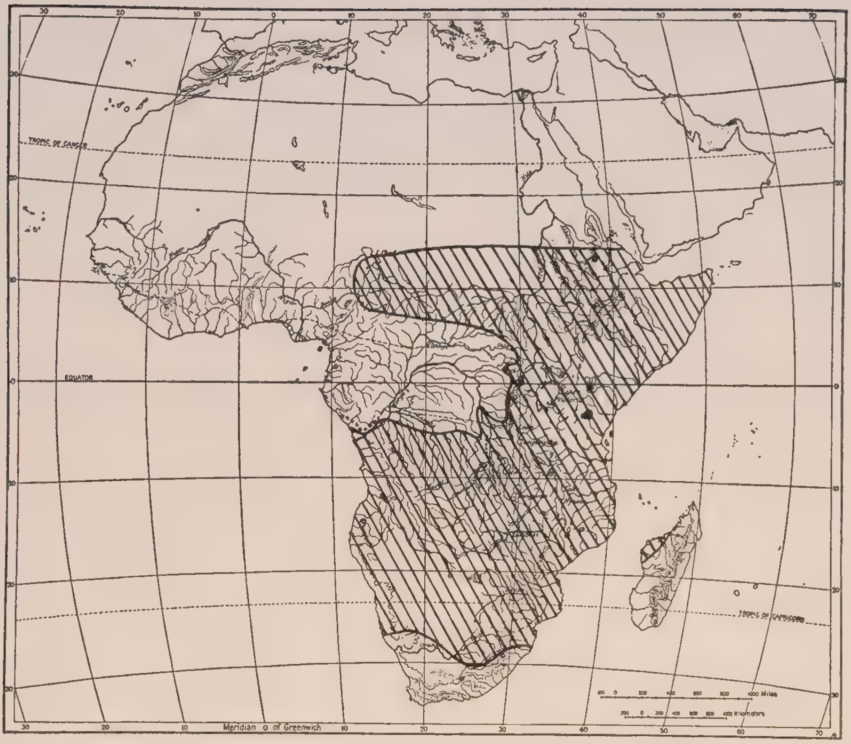
[1] Lloyd, L. 1915. 'On the association of warthog and the nkufu tick (*Ornithodorus moubata*).' Ann. Trop. Med. Paras., IX, pp. 559–560.

[2] Bequaert, J. 1919. 'L'*Ornithodorus moubata* dans le Nord-Est du Congo Belge.' Bull. Soc. Path. Exot. Paris, XII, pp. 517–520.

Rodhain, J. 1919. 'Remarques au sujet de la biologie de l'*Ornithodorus moubata*.' C. R. Soc. Biol. Paris, LXXXII, pp. 937–940.



MAP No. IX. — Showing the present known distribution of *Ornithodoros moubata* (Murray). The light interrupted line marks the extent of the West African and Congo rain forest the Orange River. Lamoureux (1913) found it on the northwestern coast of Madagascar. It has been observed south of Lake Chad by Closel, but there appears to be no other record of its existence in the Sudan.[1]

Ornithodoros moubata is the only species of the genus known with certainty from the Belgian Congo. "*Ornithodoros savignyi caecus,*" listed by Schwetz (1927, Rev. Zool. Afric., XV, 1, p. 88), from Mateba, is a synonym of *O. moubata.* Another species, *O. savignyi* (Audouin), differing in the presence of eyes, should be searched for, since it occurs in Rhodesia, Tanganyika Territory and Uganda. Neumann (1896, Mém. Soc. Zool. France, IX, p. 29) recorded it from Landana, Portuguese Congo, but most probably by error, since he had not recognized *O. moubata* at the time.

Another tick of the family Argantidae, *Argas persicus* (Oken), has been reported from the Katanga, where it was first found in chicken coops at Elisabethville by Dr. R. Mouchet in 1916. J. Schwetz (1927, Rev. Zool. Afric., XV, 1, p. 74) records it also from the Lower Congo (Boma and Mateba).

No species of *Argas* or *Ornithodoros* are at present known from Liberia.

SARCOPTIDAE

Sarcoptes scabiei (Linnaeus)

Acarus siro scabiei Linnaeus, 1758, 'Syst. Nat.,' Ed. 10a, p. 616 (Europe, America).

Acarus scabiei de Geer, 1778, 'Mém. pour Servir à l'Histoire des Insectes,' VII, p. 94, Pl. V, figs. 12–14.

Sarcoptes scabiei Latreille, 1802, 'Hist. Nat. Crust. Ins.,' III, p. 67. Warburton, 1920, Parasitology, XII, p. 272, figs. 1–2, Pl. XV.

Sarcoptes hominis Hering, 1838, 'Krätzmilben der Thiere u. Verwandte Arten,' (Bonn).

Sarcoptes scabiei var. *hominis* Buxton, 1921, Parasitology, XIII, p. 146, figs. 1, 5, and 6.

LIBERIA.— The human itch-mite is of common occurrence among the natives of that country. Dr. Max Theiler found scabies prevalent in Kru Town near Monrovia. At Gbanga we were told of a skin disease, known as "craw-craw" among the Libero-Americans, which was said to be very contagious during the heavy rains, much less so during the drier months. Several cases were brought to us for study and in the scrapings from the skin Dr. Theiler and I were able to demonstrate *Sarcoptes scabiei.*

These findings support Blacklock's[2] conclusions that the disease called "craw-craw" in many parts of West Africa is in most cases identical with scabies. Of course, one must expect the name to be applied sometimes to other skin diseases causing lesions somewhat similar in aspect to those produced by itch-mites.

The generic name *Sarcoptes* Latreille (1802), with *scabiei* as genotype, having now been placed in the Official List of Generic Names (1929, Smithson.

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[1] In 1919 (*loc. cit.*), I called attention to the fact that in the Plateau of the Walendu, on the western shore of Lake Albert, *O. moubata* was evidently not a recent introduction, as in the Ituri and Semliki Basins and in Uganda. I therefore regarded the Walendu Plateau as *one* of the primitive, autochthonous centers of this tick. Since this statement seems to have been misunderstood, I want to emphasize that the important centers of dispersal of *O. moubata* have always been in the dry areas of East Africa.

[2] Blacklock, B. 1924. 'Craw-craw in Sierra Leone.' Ann. Trop. Med. Paras., XVII, 3, pp. 253–262, Pls. XVI–XVII.

Miscell. Coll., LXXIII, No. 6, pp. 20–24), it is hoped that we shall be spared any further discussion of the nomenclature of the itch-mite.

TROMBIDIIDAE

Trombicula centropodis Ewing

Trombicula centropodis Ewing, 1928, Proc. Ent. Soc. Washington, XXX, p. 78 (larva).

Liberia.— Gbanga, September 26, 1926. Several larvae agglomerated within small, open, cup-shaped tumors of the skin on the thigh of a coucal *Centropus senegalensis senegalensis* (Linnaeus).

The following is a copy of the original description:

> "Palpi not angulate laterally on the margins of large second segments; first palpal seta with several barbs; second palpal seta also with barbs. Palpal claw trifurcate, the accessory prongs arising from near the middle; inner accessory prong longer than the outer and reaching almost to the tip of claw proper. Chelicera with stout fang, only slightly curved. Dorsal plate as long as broad, front margin slightly incurved, posterior margin strongly arched outwardly and forming an angle at the median line. Pseudostigmata situated near the middle of dorsal plate; pseudostigmatic organs very long, setiform, basal half simple, distal half with barbs. Eyes situated about one-half the width of the dorsal plate laterally from the margins of the same; front eyes almost twice the diameter of the hind ones. Dorsal abdominal setae twenty in number, medium in length and tapering toward their tips. Front pair of legs longer than the second pair and about equal in length to the body of the unengorged larva.
>
> "Length of unengorged larva, 0.34 mm.; width, 0.23 mm.
>
> "The dorsal shield of this species is of an unusual shape, being similar to that of *T. ardeae* (Trägårdh). *T. centropodis* differs from this species in having much shorter body setae."

Leeuwenhoekia sp.

Liberia.— Du River (Camp No. 3), larvae on a small bat, *Petalia arge* (Thomas), August 1926. (Identified by Dr. H. E. Ewing.)

ANALGESIDAE

Falculifer sp.

Belgian Congo.— Western slopes of Mt. Ruwenzori, at about 7000 ft., numerous specimens of the hypopial stage in the connective tissue of the abdomen of a wild pigeon, *Columba arquatrix* Temminck, December 19, 1926 (J. P. Chapin). According to Dr. Chapin, a similar parasite was found in the same locality in the connective tissue of a plantain-eater, *Ruwenzorornis johnstoni* (Sharpe).

The adult mites of the genus *Falculifer* Railliet live freely on birds, feeding upon the feathers and epidermal scales. They probably do very little or no damage to the birds in that stage, but may be rather of service in keeping the skin and feathers clean. It is impossible to identify or describe the species of Ruwenzori from the hypopial stage.

N. Banks (1915. 'The Acarina or mites.' U. S. Dept. Agric. Rept. No. 108, pp. 123–125) gives the following interesting résumé of the life history of *Falculifer rostratus* (Buchholz), the common species of domestic pigeons:[1]

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[1] Reuter, E. 1904. 'Die hypopiale Nymphe von *Falculifer rostratus* (Buchh.) als Endoparasit der Taube.' Meddel. Soc. Fauna Flora Fennica, XXX, pp. 91–96.

Pillers, A. W. N. 1927. 'Perforations in pigeons' feathers due to the mite, *Falculifer rostratus*, Buchholz.' Veter. Jl., London, LXXXIII, 8, pp. 410–413.

"The adult stage differs but little from the normal bird mite, except that there are two forms of the male — one which has considerable resemblance to the female and the other which has several secondary sexual characters, the anterior pairs of legs being long and heavy and the immovable finger of the mandibles being greatly enlarged and lengthened. There is, however, an hypopial stage in the life of this mite which has been the theme of much discussion among acarologists for many years. This hypopial form was described by Filippi as *Hypodectes* and by Nitzsch as *Hypoderas*. *Hypodectes* is found in various parts of the internal anatomy of birds, generally in the areolar and peritracheal tissues. It is of an elongate form, rounded in front and behind, and with eight short legs, two pairs in front and two other pairs toward the posterior end. There are no mouth organs, and Slosarsky, who examined the anatomy, found no internal structures save a few muscles attached to the legs. From this it was evident that *Hypodectes* was a nymph in the state of hystolysis. Mégnin soon made a more extended study and found that the mite was a stage in the life history of a *Pterolichus* (now placed in the genus *Falculifer*). Mégnin considers that when the *Falculifer* finds that it is being deprived of shelter and food by the birds pulling out their feathers, certain normal nymphs transform into the hypopial *Hypodectes*. This then crawls into the respiratory organs, or into the hair follicles, burrows some distance, and there remains until normal conditions are reestablished, when it reappears on the outside."

DERMANYSSIDAE

Liponyssus bacoti (S. Hirst)

Leiognathus bacoti S. Hirst, 1913, Bull. Ent. Res., IV, 2, p. 122 (♀; Assiut, Egypt, off *Mus norvegicus*); 1914, *loc. cit.*, V, 3, p. 225, figs. 12–14 (♂ ♀).

Liponyssus bacoti Ewing, 1922, Proc. U. S. Nat. Mus., LXII, Art. 13, p. 18, Pl. I, fig. 10 (♂ ♀); 1929, 'Manual of External Parasites,' p. 15, fig. 4.

LIBERIA.— Paiata, sucking blood on the arm of man, October 15, 1926. Gbanga, off *Rattus rattus alexandrinus* (Geoffroy), September 22, 1926. (Determined by Dr. H. Ewing).

This is a common and cosmopolitan parasite of mice and rats, which has often been recorded as annoying man. It has been introduced into the United States.

Liponyssus sp.

LIBERIA.— Gbanga, off a squirrel, *Heliosciurus rufobrachium maculatus* (Temminck), September 16, 1926.

This is possibly the mite described as *Leiognathus liberiensis* S. Hirst, 1912, Bull. Ent. Res., III, p. 371, fig. 2; ♀; off a squirrel at Rebbo, Bassa, Liberia.

Pneumonyssus Banks

The genus *Pneumonyssus* was established by N. Banks[1] for a parasitic mite taken from the lungs of an East Indian monkey ("*Cynocephalus*"), from southern Sumatra. A number of lung mites have now been described, generally from monkeys kept in captivity, as may be seen from the subjoined list; but some of these species are doubtfully distinct.

Pneumonyssus simicola N. Banks, 1901, Geneesk. Tijdschr. Nederl. Indië, XLI, p. 335 (♀); 1904, Proc. U. S. Nat. Mus., XXVIII, p. 53, figs. 94–96. In the lungs of a monkey ("*Cynocephalus*") from southern Sumatra.

Pneumonyssus duttoni Newstead and Todd, 1906, Liverpool School Trop. Med., Memoir XVIII, p. 42, Pl., figs. 1–10 (♀). Newstead, Dutton and Todd, 1907, Ann. Trop. Med. Paras., I, p. 97. In the bronchial passages of *Cercopithecus schmidti*, in the Kasongo district, Belgian Congo.

Pneumonyssus griffithi Newstead, 1906, Liverpool School Trop. Med., Memoir XVIII, p. 48, Pl., figs. 1–8*a* (♀). In the lungs of an Indian monkey, *Macacus rhesus*, kept in captivity in England.

Pneumotuber macaci Landois and Hoepke, 1914, Centralbl. Bakt. Parasitenk., Abt. 1, Orig., LXXIII, p. 393, figs. 1–3, Pl., figs. 1–3 (♀). In the lungs of *Macacus rhesus*, kept in captivity at Breslau. The genus *Pneumotuber* is most probably identical with *Pneumonyssus*.

Pneumonyssus foxi Weidman, 1915, Jl. of Parasitology, II, p. 44, Pl., figs. 1–10 (♂ ♀). In nodules under the pleura of *Macacus rhesus*, kept in captivity at Philadelphia. This parasite was at first doubtfully referred to *Pneumotuber macaci* (Weidman, 1915, Jl. Comp. Path. Therap., XXVIII, pp. 326–330). The following investigators also found mites in the lungs of *Macacus rhesus*, which they referred to *P. foxi:* Duncan, 1920, Jl. Roy. Micr. Soc. London, XLIII, pp. 163–168, Pl. IV (monkeys in captivity in England); Helwig, 1925, Amer. Jl. Path., I, pp. 389–395, Pls. LXI–LXII (monkeys in captivity at the University of Kansas); and Gay and Branch, 1927, Amer. Jl. Trop. Med., VII, pp. 49–55, figs. (in 20 out of 25 monkeys recently arrived in New York from India).

Pneumonyssus sp. n., regarded as distinct from those known to him, but not named; Wurm, 1926, Centralbl. Bakt. Parasitenk., Abt. 1, Orig., XCVIII, pp. 514–521, fig. 6 (♀). In the lungs of *Macacus rhesus*, in captivity at Tübingen.

J. A. Murray, 1919, Proc. Zool. Soc. London, p. 14, also mentions the occurrence of unnamed parasitic mites in the lungs of *Macacus rhesus* at the London Zoölogical Gardens.

A parasitic mite, found by the Harvard Expedition in a baboon of the eastern Belgian Congo, was referred for study to Dr. H. E. Ewing, who has recently described it as a new species of *Pneumonyssus*. In his paper Dr. Ewing also gives a key to the four lung mites from monkeys that give every evidence of being distinct species.[2]

Pneumonyssus congoensis Ewing

Pneumonyssus congoensis Ewing, 1929, Proc. Ent. Soc. Washington, XXXI, p. 129 (♀).

Belgian Congo.— Lulenga, in the windpipe of a young baboon, *Papio tessellatus* Elliot, March 4, 1927. The animal was apparently in perfect health.

The following is a copy of the original description:

"*Adult female.* — Capitulum quadrangular, about one and a half times as long as broad, with retracted chelicerae occupying most of internal space. Palpi greatly reduced, in length not equal to width of capitulum; first segment very short, disclike, about three times as broad as long; second

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[1] Banks, N. 1901. 'A new genus of endoparasitic acarians.' Geneesk. Tijdschr. Nederl. Indië, XLI, pp. 334–336.

See also: Grijns, G. and De Haan, J. 1901. 'Acariden als endoparasieten.' Geneesk. Tijdschr. Nederl. Indië, XLI, pp. 176–178, figs. 9–11 (on Pl.).

[2] Ewing, H. E. 1929. 'Notes on the lung mites of primates (Acarina: Dermanyssidae), including the description of a new species.' Proc. Ent. Soc. Washington, XXXI, pp. 126–130.

segment about half as broad as the first but slightly longer; third segment about two-thirds as broad as second segment and slightly longer than broad. This third segment is indistinctly divided about its middle and bears distally two prominent tactile setae, the outer of which is longer than the palpus itself. Chelicera with two chelae, each being modified into a sharp, tapering piercer; outer chela with a prominent elbow near its base and a long, curving, lance-like distal part; inner chela smaller than outer and without the elbow. Dorsal plate long, eggshape in outline and completely covering the cephalothorax above. It is well scleritized, extends backward past the fourth pair of coxae and bears about a dozen, short, subequal setae. Ventral plate irregularly diamond-shape, with three pairs of setae; first pair subapical; second pair situated just in front of lateral angles of plate near margin of same; third pair near posterior end, tips of setae themselves extending beyond tip of plate. Anal plate eggshape in outline, somewhat angulate behind; anal opening a little more than a third as wide as anal plate is broad; the two paired anal setae slightly longer than the single posterior seta, and situated slightly in front of anterior rim of anal opening. Spiracles surrounded with irregularly scleritized, bulblike walls. They are situated dorsally above the posterior coxae just under the lateral margins of dorsal plate. Tarsal claws well developed, particularly those of legs II and III; first pair of tarsal claws appressed; second and third pairs large, angulate, strongly divergent; fourth pair similar to second and third pairs but smaller and less angulate.

"Length of nongravid female, 0.61 mm.; width, 0.18 mm. Length of gravid female, 0.87 mm.; width, 0.36 mm."

PARASITIDAE

Laelaps bakeri S. Hirst

Laelaps giganteus Berlese var. *bakeri* S. Hirst, 1925, Proc. Zool. Soc. London, I, p. 67, fig. 14 (♂ ♀; off several species of rodents, from Algeria, Uganda, Kenya Colony, Nyasaland, Orange Free State, and Cape Province).

LIBERIA.— Du River, Camp No. 3, off striped rat, *Lemniscomys striatus striatus* (Linnaeus), July 29, 1926. Gbanga, off *Rattus rattus alexandrinus* (Geoffroy), September 16, 1926. (Identified by Dr. H. Ewing).

BELGIAN CONGO.— Luvungi, off a mouse, *Mastomys coucha ugandae* (De Winton), January 30, 1927. (Identified by Dr. H. Ewing).

TANGANYIKA TERRITORY.— Vituri, off *Rattus delectorum* Thomas, October 29, 1926 (Arthur Loveridge). Amani, off *Pelomys fallax fallax* Peters, November 29, 1926 (Arthur Loveridge). (Determined by Dr. H. Ewing). Uluguru Mts., off *Pelomys fallax fallax* Peters, October 15, 1926 (Arthur Loveridge). (Identified by Prof. G. F. Ferris).

This common parasite of various species of rodents is widely distributed in Africa.

SPINTURNICIDAE

Spinturnix sp.

LIBERIA.— Monrovia, off a small bat, *Eptesicus tenuipinnis* (Peters), July 16, 1926.

TANGANYIKA TERRITORY.— Bagilo, off bats, *Pipistrellus nanus* (Peters) and *Miniopterus natalensis arenarius* Heller (Arthur Loveridge).

INSECTA

ISOPTERA [1]

KALOTERMITIDAE

Kalotermes (Neotermes) aburiensis (Sjöstedt)

Neotermes aburiensis Sjöstedt, 1926, K. Svenska Vet. Ak. Handl., (3) III, No. 1, p. 39 (soldier; Aburi, Gold Coast).

Liberia.— Gbanga, from a nest in a log of firewood brought in from the forest, September 18, 1926. The intestinal tract of these termites contained flagellates of two species, as well as numerous spirochaetes, but no gregarines.

TERMITIDAE

Macrotermes (Bellicositermes) natalensis (Haviland)

Termes natalensis Haviland, 1898, Jl. Linn. Soc. London, Zool., XXVI, p. 383, Pl. XXIII, figs. 7–10 (winged adults, soldier, worker; Natal).

Amplitermes natalensis Sjöstedt, 1926, K. Svenska Vet. Ak. Handl., (3) III, No. 1, p. 90.

Macrotermes (Bellicositermes) natalensis Emerson, 1928, Bull. Amer. Mus. Nat. Hist., LVII, p. 447, fig. 14, map 8, Pl. XXIII, fig. 1, and Pls. XXIV, XXV, and XXVI.

Termes tumulicola Sjöstedt, 1899, Ent. Nachricht., XXV, p. 34 (winged adult, soldier, and worker; Liberia, Togo, and Natal).

Liberia.— Zeanschue, September 1926. Monrovia, large soldiers freshly dug up and offered for sale as food in the market, July 1926. Du River (Camp No. 3), from a large mound-shaped clay nest, August 4, 1928.

A nest of this species was opened at our camp on the Du River. It was a conical mound of clay, about seven feet high, situated in a clearing of the forest (Nos. 467 to 469). Five successive zones could be distinguished in this structure, as follows (Text Fig. No. 3): (1) An outer zone consists of very wide galleries, the chief function of which appears to be to insulate the inner parts of the nest, that is to protect them against the excessive heat of the sun. Near the top of the mound there is a very large open space which continues downward to the core of the nest by means of some very wide chimneys, evidently for ventilating purposes. (2) Next comes a protective zone of compact, hard clay, traversed by very narrow galleries and with a few, small fungus gardens. In this zone were found a number of large, physogastric beetle larvae, each of them in a gallery or small cavity by itself; also a few adult carabid beetles, which may belong to the same species as the larvae. These beetles as well as the larvae are evidently predators, feeding upon the termites. (3) A zone of spacious cavities, filled with mushroom gardens, follows. This zone is widest in the lower portion of the mound. A number of staphylinid beetles were found in the remains of old mushroom gardens, as well as a wingless phorid fly, *Puliciphora spinicollis* Schmitz. According to Father H. Schmitz (1929, Rev. Zool. Bot. Afric., XVIII, 1, p. 39) this phorid fly is, however, not a true ter-

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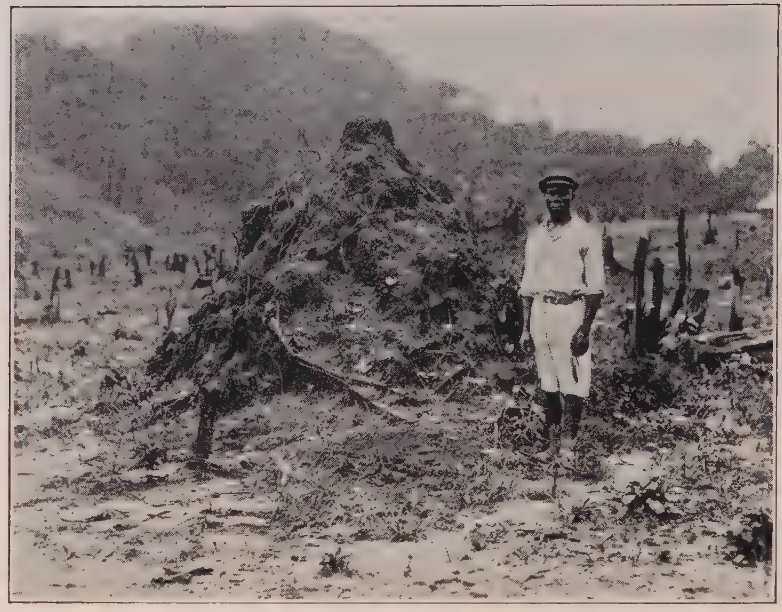
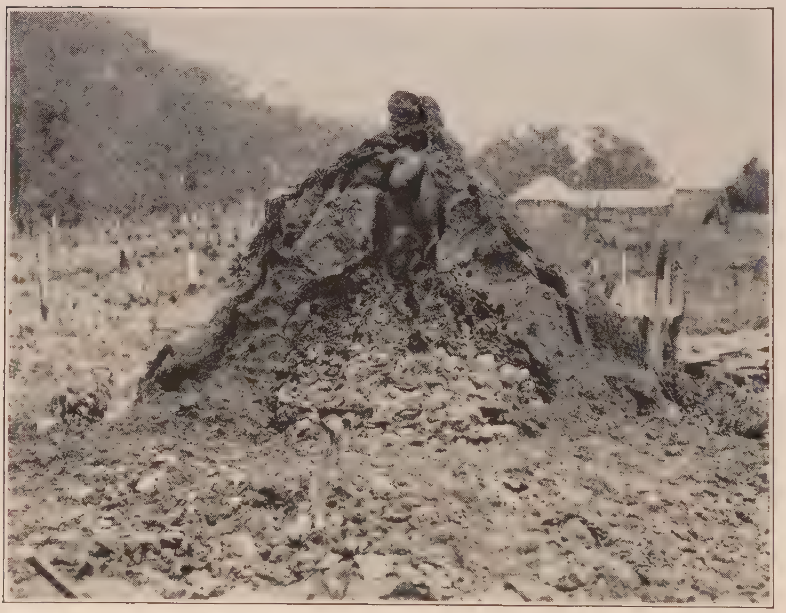
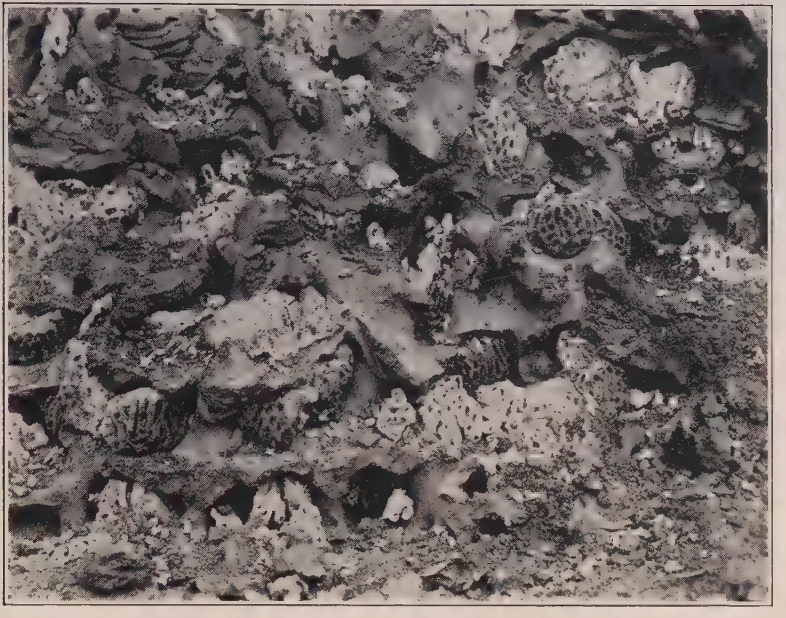
[1] The species of termites here listed have been determined by Prof. Alfred Emerson, of the University of Chicago.



No. 467. — Termitarium of *Macrotermes natalensis*, at Camp No. 3, Du River, Liberia. Outside view after clearing the plant growth



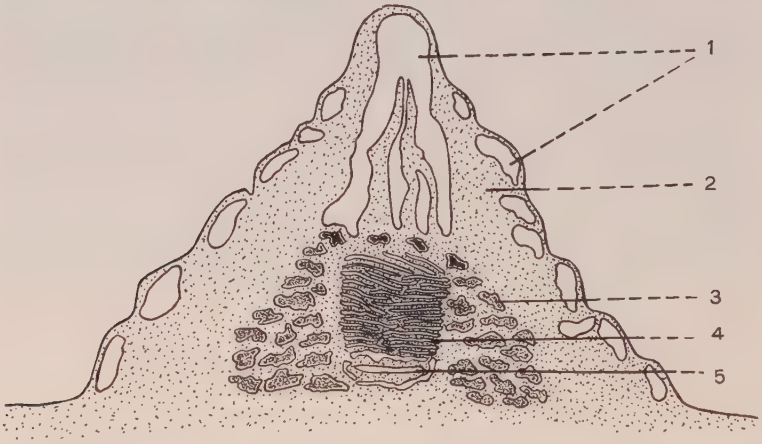
No. 468. — The same opened



No. 469. — Mushroom gardens in the termitarium of *Macrotermes natalensis*, Du River, Liberia

No. 470. — Breeding place of *Anopheles* near the cemetery of Monrovia, Liberia

mitophile. In the upper part of the nest, cavities similar to those of the mushroom gardens were filled with accumulations of blackish refuse, amidst which were living some dipterous maggots and a brown beetle larva (probably of a carabid). (4) The core of the nest consists of flattened cavities in moist clay and contains the brood, *i. e.*, the eggs and larvae of the termites. Two species of termitophilous beetles were seen running freely among the brood. (5) In the lower part of the core was found the royal chamber, a spacious, flattened cavity in the center of a thick lump of hard clay, quite distinct from the remainder of the nest, so that it can be removed as a whole. The chamber contained one very large gravid female and one deälated male; also many workers and a few soldiers, as well as a minute, white, jumping Collembole.



Text Figure 3. — Schematized longitudinal section of termitarium of *Macrotermes natalensis* (Haviland). The numbers refer to the five zones described in the text

Belgian Congo. — Irumu, from a broad, mound-shaped, bare termitarium, about 5 ft. high, in the savanna, July 2, 1914.

This termite is one of the most common species throughout the Ethiopian Region, from Dakar and Eritrea to the Orange Free State; it occurs also in Madagascar.

Macrotermes (Macrotermes) gabonensis (Sjöstedt)

Termes gabonensis Sjöstedt, 1900, K. Svenska Vet. Ak. Handl., XXXIV, No. 4, pp. 72, 73, 92, 218, 222, and 235, Pl. III, figs. B1–B2 (soldier and worker; Agoncho, Gaboon).

Macrotermes (Macrotermes) gabonensis Emerson, 1928, Bull. Amer. Mus. Nat. Hist., LVII, p. 443, fig. 12.

Termes mülleri Sjöstedt, 1898, Ent. Tidskr., XIX, p. 205 (soldier and worker; Angoncho, Gaboon).

Macrotermes mülleri Sjöstedt, 1926, K. Svenska Vet. Ak. Handl., (3) III, No. 1, p. 76 (winged adult).

Belgian Congo. — Banalia, soldiers offered for sale as food, in the native market, December 7, 1913.

Acanthotermes (Pseudacanthotermes) spiniger (Sjöstedt)

Termes (Acanthotermes) spiniger Sjöstedt, 1899, Ent. Tidskr., XX, p. 278 (soldier and worker; Umangi, Belgian Congo).

Pseudacanthotermes spiniger Sjöstedt, 1926, K. Svenska Vet. Ak. Handl., (3) III, No. 1, p. 68.

Acanthotermes (*Pseudacanthotermes*) *spiniger* Emerson, 1928, Bull. Amer. Mus. Nat. Hist., LVII, p. 433, fig. 7, Pl. XXI, and Pl. XXIII, fig. 2.

Belgian Congo. — Barumbu, October 28, 1913. These termites were building small eminences of clay from the soil, preparatory to the nuptial flight of the males and females. The eminences arose from the flat forest floor. Probably the true nest was located some distance away, since *A. spiniger* is known to build mounds.

HETEROPTERA[1]

(Rhynchota)

CIMICIDAE

Cimex hemipterus (Fabricius)

Acanthia hemiptera Fabricius, 1803, 'Syst. Rhyngotarum,' p. 113 (South America, in houses).
Cimex hemipterus J. Bequaert, 1926, 'Medical Rept. Hamilton Rice 7th Exp. Amazon,' p. 184 (with synonymy).

Liberia. — Moylakwelli, in native houses, October 27, 1926. Reppo's Town, August 31, 1926. The native name among the Kpwesi is "ndonambei."

Belgian Congo. — On board river steamers near Coquilhatville and between Ponthierville and Kindu.

Some notes on the distribution of *C. rotundatus* in tropical Africa may be found in the Bulletin of Entomological Research (1911, II, pp. 179–180, and 1912, III, p. 212, footnote). As elsewhere in the tropics, it is the common human bedbug of Equatorial Africa, while the species of temperate regions, *Cimex lectularius* Linnaeus, is either totally absent there, or at least extremely rare. Newstead, Dutton and Todd (1907, Ann. Trop. Med. Paras., I, p. 95) list *C. lectularius* from Banana, Tshumbiri, Nouvelle-Anvers, Tshofa, Kabinda, and Lusambo, in the Belgian Congo, but as they do not mention *C. rotundatus*, I suspect that their specimens were misidentified. At any rate I have not yet seen Belgian Congo specimens of *C. lectularius*. According to Bedford (1927, 11th & 12th Repts. Dir. Veter. Ed., South Africa, I, p. 783), *C. lectularius* is the common species in South Africa, while *C. hemipterus* has not yet been definitely recorded from that part of the Continent. It is quite possible that the true *C. lectularius* occurs in Upper Katanga.

Cacodmus villosus (Stål)

Acanthia villosa Stål, 1855, Öfvers. K. Svenska Vet. Ak. Förh., XII, p. 38 (no sex; Natal).
Cacodmus villosus Stål, 1873, K. Svenska Ak. Handl., N. S., XI, 2, p. 104. N. C. Rothschild, 1912, Ent. Mo. Mag., (2) XXIII, p. 86 (in part); 1913, *loc. cit.*, (2) XXIV, p. 102 (in part); 1914, Bull. Ent. Res., V, p. 41, figs. 1 (♀) and 4 (♂). Reuter, 1913, Zeitschr. Wiss. Insektenbiol., IX, p. 362. Bedford, 1927, 11th and 12th Repts. Dir. Veter. Ed., South Africa, I, p. 784.

Belgian Congo. — Avakubi, one male, off *Pipistrellus musciculus* Thomas, February 26, 1914 (J. P. Chapin).

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[1] The interesting bat parasites of the family Polyctenidae are reported upon by Prof. G. F. Ferris, later in this chapter.

The penis of this male agrees perfectly with Rothschild's drawing of this organ in *C. villosus,* a species known thus far from Transvaal and Nyasaland. In the Transvaal Dr. H. Brauns found it on *Eptesicus capensis* (A. Smith).

DERMAPTERA

HEMIMERIDAE

Hemimerus hanseni D. Sharp

Hemimerus hanseni D. Sharp, 1895, 'Cambridge Natural History,' V, p. 217, figs. 114–116. Rehn, 1924, Bull. Amer. Mus. Nat. Hist., XLIX, p. 352 (♂ ♀).

Belgian Congo. — Burunga, off *Cricetomys gambianus* Waterhouse, March 23, 1927.

This peculiar parasite is known from the Gold Coast, Cameroon, the Belgian Congo, Uganda, Kenya Colony, and Tanganyika Territory. A species of *Hemimerus,* taken in Liberia by O. F. Cook, has been referred to *H. talpoides* Walker (originally described from Sierra Leone) and this identification was possibly correct.

ORTHOPTERA

The following notes on an interesting wingless grasshopper of the Kivu volcanoes, have been contributed by Mr. J. A. G. Rehn, of the Academy of Natural Sciences, Philadelphia, who has kindly named the specimens obtained by the Harvard Expedition.

ACRIDIIDAE

Subfamily Pyromorphinae

Parasphena ruandensis Rehn

Parasphena ruandensis Rehn, 1914, Wissensch. Ergebn. Deutschen Zent.-Afr.-Exped. 1907–1908, V, Zool., III, Lief. 1, p. 99 (♂ ♀; Ninagongo, Virunga Volcanoes, north of Lake Kivu, 3,000 meters elevation, type locality; Karissimbi, Virunga Volcanoes, 2,900 meters elevation; southeast shore of Lake Kivu; Rugege Forest, southwest Ruanda, 1,800 meters elevation; Bugoie Forest, northwest Ruanda, 2,500 meters elevation.)

Belgian Congo. — Kabara in the saddle between Mt. Mikeno and Mt. Karissimbi, at an elevation of 10,500 feet, Virunga Volcanoes, March 16, 1927. Male and female, taken in copula.

The Kabara specimens have been compared with a series of the original material of the species, including four male paratypes from Ninagongo, and no important or noteworthy differences are apparent. The species exhibits a distinct amount of individual variation in the length and robustness of the antennae, regardless of sex or locality. However, this variation is in the thickness and length of the segments, the number of which is not increased or diminished. There is also some variation in the exact curvature of the lateral margins of the fastigium, which is equally individual in character.

The genus *Parasphena* is restricted to Ethiopian Africa, ranging from Eritrea to the Transvaal, and northwestward in Portuguese West Africa to Caconda. Three of the species of equatorial Africa, of which *ruandensis* is one, are found solely on high mountains and other elevated areas. The species are flightless and apparently of relatively localized distribution.

DIPTERA

PSYCHODIDAE

Subfamily Phlebotominae

Phlebotomus sp.

Belgian Congo. — Kamaniola, one female biting man inside a mosquito-bar at night, February 2, 1927.

The species cannot now be determined; but the record is of interest as showing that these biting midges exist in the valley of the Ruzizi River, between Lake Tanganyika and Lake Kivu. Thus far *Phlebotomus* has been but little investigated in the Belgian Congo. Practically all that is known has been reviewed in a recent paper by Adler, Theodor and Parrot.[1] These authors have described three new species: *Phlebotomus collarti*, from Stanleyville; *P. schoutedeni*, from Stanleyville and Barumbu; and *P. schwetzi*, from Stanleyville, Likimi, Barumbu, and Kinshasa. They have also recorded *P. ingrami* Newstead, from Elisabethville; *P. africanus* Newstead, from Stanleyville and Likimi; and *P. simillimus* Newstead, from Stanleyville, Bosanga, Mundjunga, Mimbo, and Barumbu. An additional new species, *P. ghesquierei*, has been described by Parrot (1929, Rev. Zool. Bot. Afric., XVIII, 1, p. 90), from Boma.

CULICIDAE

The mosquitoes collected by the Expedition were identified by Mr. F. W. Edwards, of the British Museum (Natural History), who has recently published the description of the only new species obtained.

The collecting of adult mosquitoes in houses and in the bush was supplemented by the breeding of larvae, wherever an opportunity was available. It may be useful to present a brief account of what is known at present of the mosquito fauna of Liberia and the Belgian Congo.

The Mosquitoes of Liberia

The mosquitoes of Liberia have hardly been studied thus far. In her recent monograph of the African anopheline mosquitoes, Miss A. M. Evans (1927) gives no Liberian records for any of the species. Ziemann (1902), however, has mentioned the occurrence of *A. gambiae* Giles at Monrovia. I have collected both that species and *A. funestus* Giles. Although these are the two most important anophelines from a medical point of view, it is certain that several other species are to be found in Liberia. The only other mosquito previously recorded from Liberia is *Aëdes aegypti* (Linnaeus). My collection includes the following eighteen species:

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[1] Adler, S., Theodor, O., and Parrot, L. 1929. 'Phlébotomes du Congo belge.' Rev. Zool. Bot. Afric., XVIII, 1, pp. 72–89.

Megarhinus brevipalpis (Theobald).
Eretmapodites inornatus Newstead.
“ *chrysogaster* Graham.
Armigeres argenteoventralis (Theobald).
Aëdes (*Stegomyia*) *aegypti* (Linnaeus).
“ “ *africanus* (Theobald).
“ “ *apicoargenteus* (Theobald).
Aëdes (*Banksinella*) *fuscinervis* Edwards.
“ “ *palpalis* (Newstead).
Aëdes (*Aëdimorphus*) *tarsalis* (Newstead).
Culex (*Culex*) *quinquefasciatus* Say.
“ “ *consimilis* Newstead.
“ “ *pruina* Theobald.
“ “ *decens* Theobald.
“ (*Neoculex*) *rima* Theobald.
Lutzia tigripes (Grandpré).
Anopheles (*Myzomyia*) *gambiae* Giles.
“ “ *funestus* Giles.

In Liberia the mosquitoes most troublesome and dangerous to man are a few domestic or urban species, whose breeding places are almost entirely the result of human activities. In the primary rain forest, second-growth, swampy forest, or mangrove, away from the towns, one is but little annoyed by these insects. In the towns, however, one is bitten mostly by *Aëdes aegypti*, *Culex quinquefasciatus*, *Anopheles gambiae*, and *A. funestus*, all of which are important carriers of human diseases. At Monrovia, I found that even these mosquitoes were not particularly numerous nor annoying during July and November; at any rate, they were much less abundant than in many other tropical places I have visited. Dr. A. W. Sellards had a similar experience in March, so that apparently much the same conditions prevail throughout the year. An investigation of the town and its immediate surroundings disclosed relatively few breeding places, although no attempt had ever been made at controlling or eliminating them. Some of these breeding places, such as open ditches of stagnant water or empty cans near houses, could easily be dealt with. The most difficult to control, however, will be the large open wells, surrounded by vertical stone walls, that are found in almost every yard throughout the town. At Monrovia both anophelines and *Aëdes aegypti* were breeding in them. Some of the other old towns of the West African coast have the same problem. Thus at Lagos J. M. Dalziel (1920, Bull. Ent. Res., XI, p. 259) found twelve species of mosquitoes breeding in the wells: 51.3 per cent of the samples contained *Aëdes aegypti;* 14.7 per cent, *Culex decens;* and 13.2 per cent, *Anopheles gambiae.*

At present the wells furnish practically all the water used in Monrovia for cooking, drinking and other domestic purposes. As it would be impossible to suggest any other practical method of supplying the town with water, the removal of the wells is out of the question. It might be possible to close the top with concrete and to provide every well with a pump; but even this suggestion could probably not be carried out under existing conditions. In order to be effective, it should be applied to all the wells of the town. Perhaps the proper solution of the problem might be to stock the wells with certain small fishes that feed upon mosquito larvae. To be most successful, such attempts at control will probably have to use two types of fishes, *viz.*, surface feeders (such as species of *Haplochilus* or *Gambusia affinis*) against the anopheline larvae, and bottom feeders (such as species of *Dormitator*) against those of *Aëdes aegypti*.[1]

THE MOSQUITOES OF THE BELGIAN CONGO

The mosquito fauna of the Belgian Congo, although as yet but partially known, is very large. This is due to the extent of the territory as well as to the many different ecological conditions met with there. In 1927, Dr. J. Schwetz published the first comprehensive list of Congo mosquitoes, enumerating one hundred and five species and six varieties.[2] A number of additional species, discovered since, have been recorded by H. Schouteden, C. Seydel, A. Duren, F. W. Edwards, and A. M. Evans; while the Harvard African Expedition obtained an undescribed species, *Culex ninagongoensis* Edwards. All these findings bring the total number of mosquitoes known at present (December 1929) from the Belgian Congo to one hundred and twenty species and eleven varieties, as shown by the subjoined list.[3]

The most striking feature brought out by this list is the large number of anophelines. Out of a grand total of twenty-eight species described from the Ethiopian Region, no less than twenty have been recorded from the Belgian Congo. Most of these are widely distributed over Africa; a few, such as *A. obscurus*, are strictly West African; and several, such as *A. argenteolobatus*, *A. aureosquamiger*, *A. distinctus*, *A. kingi*, and *A. transvaalensis*, belong to the East-and-South African fauna, and, in the Belgian Congo, have been only found in the Katanga.

Megarhinus brevipalpis (Theobald).
* *Uranotaenia alboabdominalis* Theobald.
* “ *balfouri* Theobald.
“ *coeruleocephala* Theobald.
“ *pallidocephala* Theobald.
Uranotaenia (*Pseudoficalbia*) *fusca* Theobald.
“ “ *inornata* Theobald.
“ “ *mashonaensis* Theobald.
Hodgesia cyptopus Theobald.
* “ *sanguinae* Theobald.
Eretmapodites chrysogaster Graham.
“ *grahami* Theobald.
“ *inornatus* Newstead (*E. melanopous* Graham).
Eretmapodites leucopous Graham.
“ *oidipodeios* Graham.
“ *quinquevittatus* Theobald.
Armigeres albomarginatus (Newstead).
* *Aëdes* (*Stegomyia*) *aegypti* (Linnaeus).
“ “ *africanus* (Theobald).
“ “ *apicoargenteus* (Theobald).
“ “ *chaussieri* Edwards.
“ “ *luteocephalus* (Newstead).
“ “ *masseyi* Edwards.
“ “ *poweri* (Theobald).
“ “ *schwetzi* Edwards.
“ “ *simpsoni* (Theobald).
* “ “ *vittatus* (Bigot).
Aëdes (*Banksinella*) *crassiforceps* Edwards.

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[1] A useful review of this subject is contained in a pamphlet issued by the International Health Board of the Rockefeller Foundation: 'The use of fish for mosquito control.' (New York, 1924, 120 pp.).

[2] Schwetz, J. 1927. 'Synopsis des moustiques connus du Congo belge.' Rev. Zool. Afric., XV, 3, pp. 271–319.

[3] In drawing up this list every effort has been made to eliminate synonyms. *Culex thalassius* Theobald has not been included; obviously, as Schwetz (*loc. cit.*, p. 300) has pointed out, this species does not occur in the Belgian Congo.

The forms marked with an asterisk have been collected by the Harvard African Expedition.

Since the manuscript was sent to the printer, Dr. H. Schouteden has reported the occurrence in the Belgian Congo of three additional mosquitoes: *Harpagomyia trichorostris* Theobald, *Aëdes* (*Aëdimorphus*) *abnormalis* Theobald, and *Aëdes* (*Aëdimorphus*) *nigeriensis* Theobald (1930, Rev. Zool. Bot. Afric., XVIII, pp. 431–433). These bring the total number of species known from the Belgian Congo to one hundred and twenty-three.

Aëdes (*Banksinella*) *lineatopennis* (Ludlow).
“ “ *palpalis* (Newstead).
“ “ *punctocostalis* (Theobald).
Aëdes (*Aëdimorphus*) *albocephalus* (Theobald).
“ “ *alboventralis* (Theobald).
“ “ *argenteopunctatus* (Theobald).
“ “ *congolensis* Edwards
“ “ *cumminsii* (Theobald)
“ “ var. *mediopunctatus* (Theobald).
“ “ *dentatus* (Theobald).
“ “ *domesticus* (Theobald).
“ “ *irritans* (Theobald).
“ “ *phyllolabis* Edwards.
“ “ *pubescens* Edwards.
“ “ *punctothoracis* (Theobald).
“ “ *rhecter* Dyar.
“ “ *simulans* Carter.
“ “ *tarsalis* (Newstead).
Mucidus africanus (Theobald).
“ *scatophagoides* Theobald.
Taeniorhynchus (*Coquillettidia*) *annettii* Theobald.
“ “ “ var. *pseudoconopas* Theobald.
“ (*Coquillettidia*) *aureus* Edwards.
“ “ *auripennis* Edwards.
* “ “ *aurites* Theobald.
* “ “ *fuscopennatus* Theobald.
“ “ *maculipennis* Theobald.
“ “ *metallicus* Theobald.
“ “ *nigrithorax* (Theobald).
* *Taeniorhynchus* (*Mansonioides*) *africanus* (Theobald).
* “ “ *uniformis* (Theobald).
Aëdomyia africana Neveu-Lemaire.
“ *furfurea* (Enderlein).
Mimomyia hispida (Theobald).
“ *mimomyiaformis* (Newstead).
“ *plumosa* (Theobald).
“ *splendens* Theobald.
Ficalbia (*Etorleptiomyia*) *mediolineata* (Theobald).
Ficalbia (*Ingramia*) *circumtestacea* Theobald.
“ “ *malfeyti* (Newstead).
“ “ *nigra* (Theobald).
“ “ *uniformis* (Theobald).
* *Lutzia tigripes* (Grandpré).
“ “ var. *fusca* (Theobald).
* *Culex* (*Culex*) *andersoni* Theobald.
“ “ *annulioris* Theobald.
“ “ “ var. *congolensis* Evans.
“ “ *argenteopunctatus* Newstead.
“ “ *bitaeniorhynchus* Giles var. *ethiopicus* Edwards.
* “ “ *consimilis* Newstead.
* “ “ *decens* Theobald.
“ “ “ var. *invidiosus* Theobald.
* “ “ *duttoni* Theobald.
“ “ *guiarti* Blanchard.
* “ “ *laurenti* Newstead.
“ “ *moucheti* Evans.
* “ “ *ninagongoensis* Edwards.
* “ “ *perfidiosus* Edwards.
“ “ *pipiens* Linnaeus.
“ “ *pruina* Theobald.
* “ “ *quasigelidus* Theobald.
* “ “ *quinquefasciatus* Say (*C. fatigans* Wiedemann).
“ “ *schwetzi* Edwards.
“ “ *simpsoni* Theobald.
“ “ *trifilatus* Edwards.
“ “ *trifoliatus* Edwards.
“ “ *univittatus* Theobald.
Culex (*Neoculex*) *andreanus* Edwards.
“ “ *kingianus* Edwards.
* “ “ *rima* Theobald.
“ “ “ var. *insignis* Carter.
“ “ *salisburiensis* Theobald.
Culex (*Protomelanocomion*) *horridus* Edwards.
Culex (*Micraëdes*) *inconspicuosus* (Theobald).
Culex (*Eumelanomyia*) *abbiventris* Edwards.
Culex (*Culiciomyia*) *cinereus* Theobald.
* “ “ *nebulosus* Theobald.
“ “ *semibrunneus* Edwards.
Anopheles (*Anopheles*) *implexus* (Theobald).
“ “ *mauritianus* Grandpré.
* “ “ “ var. *paludis* Theobald.
“ “ “ var. *ziemanni* Grünberg.
“ “ *obscurus* (Grünberg).
Anopheles (*Myzomyia*) *argenteolobatus* Gough.
“ “ *aureosquamiger* (Theobald).
“ “ *christyi* (Newstead and Carter).
“ “ *distinctus* (Newstead and Carter).
“ “ *funestus* Giles.
* “ “ *gambiae* Giles.
“ “ *kingi* Christophers.
“ “ *maculipalpis* Giles.
“ “ *marshalli* (Theobald).
“ “ “ var. *hargreavesi* Evans.

* *Anopheles* (*Myzomyia*) *marshalli* var. *moucheti* Evans.
“ “ “ var. *pitchfordi* Giles.
* “ “ *nili* (Theobald).
“ “ *pharoensis* Theobald.
“ “ *pretoriensis* (Theobald).

* *Anopheles* (*Myzomyia*) *rhodesiensis* Theobald.
“ “ *squamosus* Theobald.
“ “ *theileri* Edwards.
“ “ “ var. *seydeli* Edwards.
“ “ *transvaalensis* (Carter).
“ “ *wellcomei* Theobald.

Subfamily Culicinae

Tribe Megarhinini

Megarhinus brevipalpis (Theobald)

Toxorhynchites brevipalpis Theobald, 1901, ‘Monogr. Culic.,’ I, p. 245, figs. 68–69, Pl. IX, fig. 36 (♀; Natal). Edwards, 1912, Bull. Ent. Res., III, pp. 3 and 375 (larva).

Toxorhynchites marshallii Theobald, 1903, ‘Monogr. Culic.,’ III, p. 121, fig. 69 (♂; Salisbury, Southern Rhodesia).

Toxorhynchites conradti Grünberg, 1907, Deutsche Ent. Zeitschr., p. 405 (♀ ♂; Johann-Albrechtshöhe, Cameroon).

Liberia. — Gbanga, September 9, 1926, one female, caught inside a tent in the evening.

The large, brilliantly colored, often metallic (blue or green) mosquitoes of the genus *Megarhinus* do not suck blood. Both females and males feed on plant juices only, especially on the nectar of flowers. The larvae are predaceous, feeding upon other mosquito larvae. A large larva of *Megarhinus* was obtained at Camp No. 3, on the Du River, August 8, 1926, in a hollow stump of bamboo, together with numerous larvae of *Eretmapodites chrysogaster* Graham. It was observed catching one of these larvae. Although it was kept alive in a breeding jar for over a month, it died without pupating, on September 14.

M. brevipalpis is the most common African species of the genus, being known from Sierra Leone to Natal.

Tribe Uranotaeniini

Uranotaenia alboabdominalis Theobald

Uranotaenia alboabdominalis Theobald, 1910, ‘Monogr. Culic.,’ V, p. 508, fig. 215 (♀ ♂; Bor to Mongalla, Anglo-Egyptian Sudan). Edwards, 1912, Bull. Ent. Res., III, p. 40. Macfie and Ingram, 1916, *loc. cit.*, VII, 1, p. 17, fig. 14 (larva and pupa).

Belgian Congo. — Above Bumba, on the Congo River, one female, January 4, 1927.

According to Mr. Edwards this specimen is not quite typical. The species, known from the Sudan, Uganda, and the Gold Coast, was not included in the published lists of Congo mosquitoes. Recently, however, it was reported by Dr. Duren as having been taken at Leopoldville.

Uranotaenia balfouri Theobald

Uranotaenia balfouri Theobald, 1905, First Rept. Wellcome Res. Lab. Khartoum, (1904), p. 82, Pl. VI, fig. 6 (♀; Pibor, Anglo-Egyptian Sudan); 1906, Second Rept. Wellcome Res. Lab. Khartoum, p. 82 (♂); 1907, ‘Monogr. Culic.,’ IV, p. 561 (♀ ♂). Wesché, 1910, Bull. Ent. Res., I, p. 50, Pl. I, fig. 19, and Pl. II, figs. 1–4 (larva and pupa). Edwards, 1912, *loc. cit.*, III, p. 41. Ingram and Macfie, 1917, *loc. cit.*, VIII, p. 90 (pupa).

Belgian Congo. — Coquilhatville, one male, December 19, 1926.

U. balfouri is known from the Gambia to the Central Congo (Stanleyville) and the Anglo-Egyptian Sudan.

Tribe Culicini

Eretmapodites inornatus Newstead

Eretmapodites inornatus Newstead, 1907, Ann. Trop. Med. Paras., I, p. 12, fig. 1; Pl. I, fig. 10 (♀ ♂; Coquilhatville and Lusambo, Belgian Congo). Edwards, 1912, Bull. Ent. Res., III, pp. 47 and 385 (larva). Ingram and Macfie, 1917, *loc. cit.*, VIII, 1, p. 75 (pupa).

Eretmapodites melanopous Graham, 1909, Entomologist, XLII, p. 158 (♀ ♂; Obuasi, Gold Coast).

Liberia. — Memmeh Town, August 1926.

Numerous larvae of this mosquito were found on August 29 in empty shells of a large *Achatina* snail on a refuse heap in the village. The shells contained only a small quantity of rain-water. The first adults hatched on the morning of September 4.

No. 471. — Grove of bamboos at Camp No. 3, Du River, Liberia. Breeding place of *Eretmapodites chrysogaster* and *Megarhinus*

E. inornatus is known from Sierra Leone to the Congo.

Eretmapodites chrysogaster Graham

Eretmapodites chrysogaster Graham, 1909, Entomologist, XLII, p. 157 (♀ ♂; Obuasi, Kumasi, and Dompoasi, Gold Coast). Edwards, 1912, Bull. Ent. Res., III, p. 47, fig. 9 (larva and pupa), and p. 385; 1914, *loc. cit.*, V, 1, p. 75. Ingram and Macfie, 1917, *loc. cit.*, VIII, 1, p. 75 (pupa).

Liberia. — Du River, Camp No. 3, August 1926.

Many larvae and pupae of this mosquito were found, on August 8, in hollow stumps of cut bamboos partly filled with rain-water, near a brook in the primary virgin forest (No. 471). When disturbed, the larvae and pupae drop to the bottom where they remain hidden amongst decaying vegetable matter. In order to collect them it is necessary to rinse out the bottom of the hollow. The first adult hatched on August 9. The larvae are predaceous. In my breeding jars I observed one of them devouring a small, reddish dipterous larva.

E. chrysogaster is known from Sierra Leone to Uganda.

Armigeres argenteoventralis (Theobald)

Dendromyia argenteoventralis Theobald, 1910, 'Monogr. Culic.,' V, p. 588 (♀; Obuasi, Gold Coast).
Stegomyia argenteoventralis Edwards, 1912, Bull. Ent. Res., III, p. 12.
Dendromyia affinis Theobald, 1910, 'Monogr. Culic.,' V, p. 589, fig. 256 (♀; Obuasi, Gold Coast).

Liberia. — Du River, Camp No. 3, August 9, 1926. A few males were observed during the day visiting the flowers of a cauliflorous tree in the primary forest.

A. argenteoventralis is known from West Africa only.

Hodgesia sanguinae Theobald

Hodgesia sanguinae Theobald, 1904, Jl. Trop. Med., VII, p. 17, fig. (♀; Entebbe, Uganda); 1907, 'Monogr. Culic.,' IV, p. 579 (♀).
Hodgesia sanguinis Edwards, 1912, Bull. Ent. Res., III, p. 35; 1913, *loc. cit.*, IV, p. 59 (♂). Wigglesworth, 1929, *loc. cit.*, XX, p. 60, figs. 2*a-c* and 3*a-c* (larva and pupa).

Belgian Congo. — Kinshasa (received from Dr. Duren).

H. sanguinae is strictly West African, extending from Southern Nigeria to Uganda.

The genus *Hodgesia* may possibly have to be placed in the tribe Sabethini.

Aëdes (Stegomyia) aegypti (Linnaeus)

Culex aegypti Linnaeus, 1762, in Hasselquist, 'Palestina Reise,' p. 470.
Stegomyia nigeria Theobald, 1901, 'Monogr. Culic.', I, p. 303, Pl. XIV, fig. 56 (♀; Bonny, S. Nigeria).

The yellow fever mosquito has also been variously called *Stegomyia fasciata*, *Aëdes calopus*, and *Aëdes argenteus*. A full synonymy is given by H. G. Dyar (1922, Proc. U. S. Nat. Mus., LXII, Art. 1, pp. 94–95, and 1928, 'The Mosquitoes of the Americas' p. 239).

Liberia. — Monrovia, July 1926, Du River, Camp No. 3, August 1926, bred from larvae found in rain-water collected in cavities of cut trunks of trees, in a forest clearing, in company with larvae of *Aëdes apicoargenteus* (Nos. 472 and 473). Gbanga, September 1926, bred from larvae found in a bucket of water in camp.

Belgian Congo. — Kinshasa (bred by Dr. A. Duren). The yellow fever mosquito exists everywhere from the mouth of the Congo to Upper Katanga.

Uganda. — Kampala, April 13, 1927, in a hotel room, biting at noon.

At Monrovia the yellow fever mosquito is particularly abundant at the beginning and close of the rainy season, in April–May and October–November.[1]

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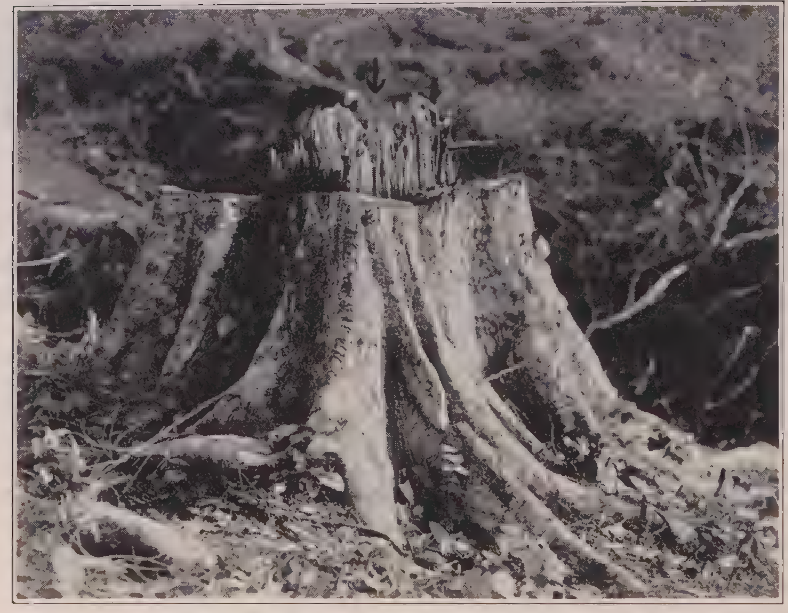
[1] Bouet, G. 1925. 'Une épidémie de fièvre jaune au Liberia.' Bull. Soc. Path. Exot. Paris, XVIII, pp. 746–753.
Wehrle, W. O. 1928. 'Das Gelbfieber in Liberia 1925 und 1927.' Arch. Schiffs- u. Tropenhyg., XXXII, pp. 401–406.



No. 472. — Breeding place of *Aëdes aegypti* and *A. apicoargenteus* (see arrow), at Camp No. 3, Du River, Liberia

No. 473. — Fig. 1. Breeding place of *Aëdes aegypti* and *A. apicoargenteus*, at Camp No. 3, Du River, Liberia

Accounts of its habits in West Africa have been published by R. Boyce (1911, Bull. Ent. Res., I, 4, pp. 233–263, 2 maps) and by J. W. S. Macfie (1915, *loc. cit.*, VI, pp. 205–229). Descriptions of the larva and pupa based upon West African specimens have been given by W. Wesché (1910, Bull. Ent. Res., I, p. 25, figs. 1–4) and J. W. S. Macfie (1917, *loc. cit.*, VII, 3, pp. 297–307; detailed description of the four distinct larval instars through which this mosquito passes between hatching from the egg and pupating; and 1920, *loc. cit.*, X, 2, pp. 161–169; detailed description of the chaetotaxy of the pupa). As has been shown by L. H. Dunn (1927, *loc. cit.*, XVIII, pp. 138–144), tree-holes are in West Africa an important breeding place of *A. aegypti*.

In addition to yellow fever, *A. aegypti* is definitely known to carry dengue fever, of which it is the chief, if not the sole vector (Cleland, Bradley, and MacDonald, 1916; Siler, Hall, and Hitchens, 1925).

I fully agree with Dyar and with Martini[1] that the yellow fever mosquito was originally an inhabitant of the Old World tropics, whence it was carried in ships to America shortly after the discovery of the New World. The fact that *Aëdes aegypti* is nowadays the only American representative of the subgenus *Stegomyia*, which possesses several other allied species in the Old World, is in my opinion convincing evidence.

Among the African *Stegomyiae*, *A. aegypti* may be recognized by the following characteristics: Clypeus covered with white scales. Thorax dorsally with lyre-shaped, white marks. Abdominal segments dorsally with whitish basal bands and lateral spots. Legs: femora with silvery tips and with a narrow white line running almost their entire length; hind tarsi with white basal rings on the first four segments, those of the first three subequal, the fifth segment all white. The markings of the abdomen and legs may vary considerably, as recently shown by Mrs. Sophia L. M. Summers Connal (1927, Bull. Ent. Res., XVIII, pp. 5–11, Pl. I).

Aëdes (Stegomyia) africanus (Theobald)

Stegomyia africana Theobald, 1901, 'Monogr. Culic.', I, p. 304, fig. 93, Pl. XIV, fig. 54 (♀ ♂; Sierra Leone; Mashonaland; Lagos; Old Calabar; Zomba, Nyasaland). Wesché, 1910, Bull. Ent. Res., I, p. 27, Pl. III, figs. 3–11 (larva and pupa). Newstead, 1911, *loc. cit.*, I, 4, p. 241. Edward, 1912, *loc. cit.*, III, p. 10.

Stegomyia dubia Theobald, 1910, 'Monogr. Culic.,' V, p. 170, fig. 62 (♀; Katemas, Bihé, Angola).

Liberia. — Kaka Town, August 20, 1926, biting man along a trail in a forest clearing, at 4.30 p.m.

This species differs from the yellow fever mosquito in having the abdomen unbanded, while the thorax bears dorsally two short, glittering, metallic lines over the anterior part. On the hind tarsi the last segment is dark, and the white basal ring of the third segment is much longer and more conspicuous than that of the other segments.

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[1] Martini, E. 1929. 'Tiergeographische Gesichtspunkte zur Beurteilung der Geschichte und Epidemiologie des gelben Fiebers.' Verh. Deutsch. Ges. Angew. Ent., 7. Mitgliedervers. München, 31. Mai-2. Juni 1928, pp. 76–81.

A. africanus is chiefly West African, extending from Sierra Leone to Uganda, Nyasaland, and Angola.

Aëdes (Stegomyia) apicoargenteus (Theobald)

Stegomyia apicoargentea Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 3, fig. (on p. 31) (♀; Obuasi and Kumasi, Gold Coast); 1910, Ann. Mag. Nat. Hist., (8) V, p. 373 (♀); 1910, 'Monogr. Culic.,' V, p. 172, fig. 63 (♀). Wesché, 1910, Bull. Ent. Res., I, p. 28, Pl. V, figs. 9–14 (larva and pupa). Edwards, 1912, *loc. cit.*, III, p. 10.

Kingia albertii Theobald, 1912, Rev. Zool. Afric., II, 1, p. 78 (♀; Belgian Congo). Edwards, 1925, Bull. Ent. Res., XV, p. 261.

Aniella togoensis Enderlein, 1923, Wien. Ent. Zeitg., XL, p. 28 (♀; Klein Popo, Togo). Edwards, 1925, Bull. Ent. Res., XV, p. 262.

Liberia. — Du River, Camp No. 3, August 1926.

Uganda. — Entebbe, April 14, 1927.

At our camp on the Du River this species was the mosquito most commonly found breeding in holes of cut tree trunks in the clearing, in which small quantities of rain water had gathered (Nos. 472, and 473). In one case it was associated with the larvae of *A. aegypti*. Throughout West Africa it is one of the most common species breeding in rot-holes of living or dead trees (see Macfie and Ingram, 1923, Bull. Ent. Res., XIII, pp. 292–293). It is readily recognized by the five silvery-white spots of the dorsum of the thorax (two large ones about the middle; two smaller ones just before the bases of the wings; and one at the anterior margin). The hind tarsi bear white rings of very unequal length, that of the fourth segment the longest; the last segment is almost all black.

A. apicoargenteus is a West African mosquito, known from Sierra Leone to Uganda.

Aëdes (Stegomyia) vittatus (Bigot)

Culex vittatus Bigot, 1861, Ann. Soc. Ent. France, (4) I, p. 227 (♀; Corsica).

Stegomyia vittata Edwards, 1917, Bull. Ent. Res., VII, 3, p. 210.

Aëdes (*Stegomyia*) *vittatus* Edwards, 1921, Bull. Ent. Res., XII, 3, p. 326.

Stegomyia sugens Theobald, 1901, 'Monogr. Culic.,' I, p. 300, fig. 92 I–II, Pl. XIII, fig. 51 (♀ ♂). (Not *Culex sugens* Wiedemann, 1828). Edwards, 1912, Bull. Ent. Res., III, pp. 9 and 375, fig. 1 (larva).

Stegomyia brumpti Neveu-Lemaire, 1905, Bull. Soc. Zool. France, XXX, p. 9, fig. (♀ ♂; Harar, Abyssinia).

Reedomyia albopunctata Theobald, 1907, 'Monogr. Culic.,' IV, p. 262 (♀; Sierra Leone).

Belgian Congo. — Kinshasa (received from Dr. Duren, who bred the species from larvae).

This species may be recognized by the four distinct white dots of the mesonotum, the white bands of the abdomen, and the white ring a little beyond the middle of the hind tibiae. The segments of the hind tarsi have broad, subequal white rings and the last segment is all white.

A. vittatus is widely distributed in the Ethiopian and Oriental Regions. Although originally described from Corsica, it has not again been found in the Mediterranean Subregion. It seems probable that Bigot's type was wrongly labelled (Edwards, 1928, Encycl. Entom., Sér. B, II, Diptera, IV, p. 167).

Aëdes (Banksinella) fuscinervis (Edwards)

Banksinella fuscinervis Edwards, 1914, Bull. Ent. Res., V, I, p. 73 (♀ ♂; Accra and Obuasi, Gold Coast).

Liberia. — Du River, Camp No. 3, August 1926. Paiata, common in swampy woods, near mud puddles, October 7, 1926.

No. 474. — Breeding place of *Aëdes fuscinervis*, *Culex consimilis*, and *Anopheles gambiae*, in a forest clearing at Camp No. 3, Du River, Liberia

On the Du River this species was found breeding in an open ditch of a forest clearing (No. 474).

So far as known *A. fuscinervis* is restricted to West Africa.

Aëdes (Banksinella) palpalis (Newstead)

Neomelaniconion palpale Newstead, 1907, Ann. Trop. Med. Paras., I, p. 31, fig. 6, Pl. I, figs. 7–9 (♂; Basoko, Belgian Congo).[1]

Banksinella palpale Carter, 1913, Ann. Trop. Med. Paras., VII, p. 581, figs. 1*a-b*, 2*a-b*, and 3*a* (♂).

Aëdes (*Banksinella*) *palpalis* Edwards, 1928, Bull. Ent. Res., XVIII, 3, p. 272 (♀; Stanleyville, Belgian Congo).

Liberia. — Gbanga, September 1926, females taken in dense primary forest.

A. palpalis is known also from the Belgian Congo and the Gold Coast.

Aëdes (Aëdimorphus) tarsalis (Newstead)

Duttonia tarsalis Newstead, 1907, Ann. Trop. Med. Paras., I, p. 18, fig. 2; Pl. II, figs. 6–8 (♀ ♂; Kisui near Ponthierville, Belgian Congo).

Ochlerotatus tarsalis Edwards, 1917, Bull. Ent. Res., VII, 3, p. 219, fig. 7*d*.

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[1] Both Carter and Edwards state that the species was originally described from Boma, which is outside the Congo rain forest belt. The type locality is Basoko, which lies within the Congo rain forest.

Duttonia africana Newstead, 1907, Ann. Trop. Med. Paras., I, p. 20, fig. 3 (♀; Kasongo, Belgian Congo).
Reedomyia biannulata Theobald, 1907, 'Monogr. Culic.,' IV, p. 263, fig. 81 (♂; Sierra Leone); 1910, *loc. cit.*, V, p. 253, figs. 115–119 (♀).
Aëdes (Aëdimorphus) tarsalis Wigglesworth, 1929, Bull. Ent. Res., XX, p. 67, fig. 6*a-e* (larva and pupa).
Reedomyia neobiannulata Theobald, 1910, 'Monogr. Culic.,' V, p. 255 (♀ ♂; Accra and Obuasi, Gold Coast; Katemas, Bihé, Angola).
Reedomyia bipunctata Theobald, 1910, 'Monogr. Culic.,' V, p. 256, fig. 120 (♀; Obuasi, Gold Coast).
Neopecomyia uniannulata Theobald, 1910, 'Monogr. Culic.,' V, p. 261, fig. 125 (♀; Kumasi, Gold Coast).

Liberia. — Paiata, October 7, 1926; both sexes common near puddles of rain-water along a native path in dense, primary forest. The females did not attempt to bite.

A. tarsalis is strictly West African, occurring from Sierra Leone to Angola and the Central Congo.

Culex (Culex) quinquefasciatus Say

Culex quinquefasciatus Say, 1823, Journ. Ac. Nat. Sci. Philadelphia, III, p. 10 (♀; Mississippi Valley). J. Bequaert, 1926, 'Medical Rept. Hamilton Rice 7th Exp. Amazon,' p. 201. Dyar, 1928, 'The Mosquitoes of the Americas,' p. 380, Pl. CII, fig. 357.
Culex fatigans Wiedemann, 1828, 'Aussereurop. Zweifl. Ins.,' I, p. 10 (♀ ♂; East Indies). Edwards, 1913, Bull. Ent. Res., IV, p. 55, fig. 4 (synonymy). Ingram and Macfie, 1917, *loc. cit.*, VIII, p. 84, fig. 7 (pupa). Edwards, 1924, *loc. cit.*, XIV, p. 395.

The extensive synonymy has been given by Dyar (1928) and Edwards (1913 and 1924).

Liberia. — Monrovia, common in July 1926.

Belgian Congo. — Common on the Congo River, where specimens were taken on board ship in the Chenal, at Yumbi, at Irebu, at Coquilhatville, near Lulonga, near Nouvelle-Anvers, above Bumba, below Basoko, at Basoko, at Barumbu and above Ponthierville, in December 1926 and January 1927.

Tanganyika Territory. — Kigoma, January 24, 1927.

As elsewhere in the tropics, this is the most common domestic mosquito in many localities of West Africa and the Belgian Congo. It occurs throughout the Ethiopian Region from the Sudan and Somaliland to Capetown. It is absent from North Africa, where it is replaced by the closely allied *Culex pipiens* Linnaeus.

C. quinquefasciatus is the regular and most common intermediary host of the human parasitic worm, *Wuchereria bancrofti* (Cobbold) (*Microfilaria nocturna*), the adult of which is often incriminated as the cause of elephantiasis in man.

Culex (Culex) univittatus Theobald var. **neavei** Theobald

Culex neavei Theobald, 1906, Second Rept. Wellcome Res. Lab. Khartoum, p. 76, fig. 37*b*, Pl. IX, fig. 4 (♀; Lualas and Lado, Anglo-Egyptian Sudan); 1907, 'Monogr. Culic.,' IV, p. 429, fig. 188 (♀). Edwards, 1914, Bull. Ent. Res., V, 1, p. 67, fig. 4 (♂).

Uganda. — Kabale, at 6,400 ft. altitude, April 9, 1927.

Ingram and Macfie (1919, Bull. Ent. Res., X, p. 68, fig. 7) have described a larva which they refer to the typical *C. univittatus.* According to Edwards (1922, *loc. cit.*, XIII, p. 102), however, this was probably an immature larva of *C. quasigelidus.*

C. univittatus is a West African species, which may, however, be identical with the Mediterranean *C. perexiguus* Theobald, the adults of these two forms being indistinguishable.

Culex (Culex) ninagongoensis Edwards

Culex ninagongoensis Edwards, 1928, Rev. Zool. Bot. Afric., XVI, 3, p. 324, fig. 1 (♀ ♂).

Belgian Congo. — Mt. Ninagongo, February 23, 1927; both sexes bred from larvae found in a small hole filled with spring-water, amidst lava rocks, at the altitude of 10,200 ft.

The original description of this species is here reproduced:

"Belongs to the *pipiens* group; resembles *C. pipiens* in its very long upper fork-cell, but differs markedly in male palpi and hypopygium.

"*Male.* — Head with yellowish scales above, the upright ones scarcely darker than the others. Proboscis entirely dark. Palpi entirely dark, the last two segments without white scales beneath; slender, almost bare, and only very slightly longer than the proboscis, last segment a little shorter than penultimate. Thorax with dark brown integument, scales light bronzy brown, almost unicolorous. Abdomen with complete and rather broad yellowish bands at bases of segments. Hypopygium with the side pieces unusually short and thick, rather densely clothed externo-ventrally with short hair; claspers rather short, broad, and almost straight; basal division of lobe scarcely prominent, with three strong rods; apical division of lobe placed almost at tip of side-piece, bearing internally a pair of short rods, one very stout, and externally an oval leaf and a flattened seta. Basal parts of hypopygium almost as in *C. andersoni* Edw. Legs blackish; all femora and hind tibiae with conspicuous yellow knee-spots; under surfaces of femora pale; hind femora with dark dorsal line and dark externally on the last sixth. Wings with linear dark scales; upper fork-cell about three times as long as its stem. Wing-length about 4.5 mm.

"*Female.* — Resembles the male in colouring. Proboscis rather paler beneath except towards tip. Palpi about one-sixth as long as proboscis. Under side of abdomen all yellowish, no dark apical bands on sternites. Wings with the upper fork even longer than in male, fully four times as long as its stem."

Culex (Culex) consimilis Newstead

Culex tigripes var. *consimilis* Newstead, 1907, Ann. Trop. Med. Paras., I, p. 23 (♀; Tshumbiri, Kasongo, Yambinga, Miambwe, and Leopoldville; all in the Belgian Congo).

Culex consimilis Edwards, 1911, Bull. Ent. Res., II, p. 259; 1912, *loc. cit.*, III, pp. 29 and 381 (larva). Macfie and Ingram, 1916, *loc. cit.*, VII, 1, p. 12 (larva and pupa).

Culex pseudoannulioris Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 15, fig. (on p. 30) (♀; Obuasi, Gold Coast); 1910, 'Monogr. Culic.,' V, p. 333, fig. 148 (♀).

Culex annulioris var. *congolensis* Evans, 1923, Ann. Trop. Med. Paras., XVII, p. 91 (♂; Leopoldville, Belgian Congo).

Liberia. — Du River, Camp No. 3, July 1926.

Belgian Congo. — Common on the Congo River, where it was taken on board ship at Bolobo and Lukolela, in December 1926.

At our camp on the Du River this mosquito was bred from larvae living in an open pond of a forest clearing, together with those of *Anopheles gambiae* (No. 474).

C. consimilis is chiefly a West African species, known from Sierra Leone to the Belgian Congo and Uganda.

Culex (Culex) pruina Theobald

Culex pruina Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. viii (♀ ♂; S. Nigeria). Edwards, 1911, Bull. Ent. Res., II, p. 263; 1912, *loc. cit.*, III, pp. 33 and 381 (larva); 1914, *loc. cit.*, V, 1, p. 73 (♂). Macfie and Ingram, 1916, *loc. cit.*, VII, 1, p. 7, fig. 6 (larva and pupa).

Culex pruinosus Theobald, 1901, 'Monogr. Culic.,' II, p. 332, figs. 311–312 (♀ ♂).

Culex pallidothoracis Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 17, figs. (on pp. 27 and 29) (♀ ♂; Obuasi, Gold Coast); 1910, Ann. Mag. Nat. Hist., (8) V, p. 377 (♀ ♂); 1910, 'Monogr. Culic.,' V, p. 370, figs. 164–165 (♀ ♂).

LIBERIA. — Lenga Town, August 1926. Paiata, October 1926.

At Lenga Town, this species was bred from larvae found in a hole of a fallen tree in a forest clearing, together with those of *Culex decens* and *Lutzia tigripes*. Two different larvae have been attributed to *Culex pruina*.

C. pruina is a West African species, extending from Liberia to the Belgian Congo.

Culex (Culex) quasigelidus Theobald

Culex quasigelidus Theobald, 1903, 'Monogr. Culic.,' III, p. 181, fig. 95, Pl. XIII (♀ ♂; Entebbe, Uganda). Wesché, 1910, Bull. Ent. Res., I, p. 38, Pl. VII, figs. 5–9 (larva and pupa). Edwards, 1911, *loc. cit.*, II, p. 258, figs. 3, 4*a*, and 5*a* (♀ ♂); 1912, *loc. cit.*, III, pp. 29 and 381 (larva). Ingram and Macfie, 1919, *loc. cit.*, X, p. 66, fig. 6 (larva and pupa).

Lasioconops poicilipes Theobald, 1903, Liverpool School Trop. Med., Mem. X, App. p. ix (♀; Bonny, S. Nigeria, and Gambia); 1903, 'Monogr. Culic.,' III, p. 236, fig. 124 (♀).

Culex taeniorhynchoides Giles, 1904, Jl. Trop. Med., VII, p. 369 (♀; Benguela).

Pseudoheptaphlebomyia madagascariensis Ventrillon, 1905, Bull. Mus. Hist. Nat. Paris, XI, p. 427 (♀; Tananarive, Madagascar).

Taeniorhynchus tenax var. *maculipes* Theobald, 1905, First Rept. Wellcome Res. Lab. Khartoum, (1904), p. 79, fig. 4, Pl. IV, fig. 4, and Pl. VI, fig. 4 (♀; Kenissa on the White Nile and Middle Sobat, Anglo-Egyptian Sudan).

Aporoculex punctipes Theobald, 1907, 'Monogr. Culic.,' IV, p. 316, fig. 110 (♀; Chinde, Nyasaland).

Culex par Newstead, 1907, Ann. Trop. Med. Paras., I, p. 25, Pl. I, fig. 11 (♀; Tshumbiri, Belgian Congo).

Culex auritaenia Enderlein, 1920, Wien. Ent. Zeitg., XXXVIII, p. 49 (♀ ♂; Tananarive, Madagascar).

BELGIAN CONGO. — On the Congo River, specimens having been taken on board ship at Lukolela and Irebu, December 1926.

C. quasigelidus is widely spread in the Ethiopian Region and Madagascar, extending also into Lower Egypt.

Culex (Culex) duttoni Theobald

Culex duttoni Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. v (♀ ♂; Conoes Creek, Duketown, S. Nigeria); 1901, 'Monogr. Culic.,' II, p. 318, fig. 302 (♀ ♂). Wesché, 1910, Bull. Ent. Res., I, p. 34, Pl. V, figs. 2–4 (larva and pupa). Edwards, 1911, *loc. cit.*, II, p. 259, fig. 4*b*; 1912, *loc. cit.*, III, pp. 31 and 379 (larva).

Culex dissimilis Theobald, 1901, 'Monogr. Culic.,' I, p. 376, figs. 130–131, Pl. XVII, fig. 67 (♀ ♂; Freetown, Sierra Leone).

Culex hirsutipalpis Theobald, 1901, 'Monogr. Culic.,' I, p. 378, figs. 132–134 (♀ ♂; Salisbury, S. Rhodesia).

Culex anarmostus Theobald, 1903, Liverpool School Trop. Med., Mem. X, App., p. vi (♀; Freetown, Sierra Leone, and Gambia).

Culex albovirgatus Graham, 1910, Ann. Mag. Nat. Hist., (8) V, p. 264 (♀ ♂; West Africa).

Belgian Congo. — Kinshasa (bred by Dr. Duren).

C. duttoni is one of the common domestic mosquitoes of West Africa, the breeding places being hardly ever found far from human habitations. It has been recorded from Gambia to Transvaal.

Culex (**Culex**) **decens** Theobald

Culex decens Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. vii (♀ ♂; Bonny, S. Nigeria); 1901, 'Monogr. Culic.,' II, p. 334, fig. 313 (♀ ♂). Edwards, 1911, Bull. Ent. Res., II, p. 263; 1912, *loc. cit.*, III, pp. 32 and 381 (larva). Macfie and Ingram, 1920, *loc. cit.*, XI, 2, pp. 105–112, figs. 1–2 (larva and pupa).

Culex masculus Theobald, 1901, 'Monogr. Culic.,' II, p. 125, figs. 216–217 (♀ ♂; Freetown, Sierra Leone).

Culex minutus Theobald, 1905, Jl. Econ. Biol., I, p. 30, Pl. IV, fig. 9–9*a* (♀; Transvaal).

Culex nigrocostalis Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 16, figs. (on pp. 27 and 30) (♀ ♂; Accra, Gold Coast); 1910, Ann. Mag. Nat. Hist., (8) V, p. 376 (♀ ♂); 1910, 'Monogr. Culic.,' V, p. 367, figs. 160–163 (♀ ♂).

Culex lividocostalis Graham, 1910, Ann. Mag. Nat. Hist., (8) V, p. 269 (♀ ♂; West Africa).

Heptaphlebomyia simplex Theobald, 1907, 'Monogr. Culic.,' IV, p. 533 (♂ only; Bihé, Angola).

The above synonymy refers to the typical form only.

Liberia. — Lenga Town, August 1926.

Belgian Congo. — Congo River at Coquilhatville and Bumba, December 1926.

At Lenga Town this species was bred from larvae found in a hole of a fallen tree in a forest clearing, together with those of *Culex pruina* and *Lutzia tigripes*.

The specimens of the Belgian Congo were referred by Mr. Edwards, with some doubt, to the var. *invidiosus* Theobald (*Culex invidiosus* Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. xi; ♀; Bonny, S. Nigeria; 1901, 'Monogr. Culic.,' II, p. 329; ♀. — Synonyms: *Culex euclastus* Theobald; *Culex chloroventer* Theobald; *Culex aquilus* Graham). At Coquilhatville the larvae were collected from rain-water that had gathered in the bottom of a steel whale-boat.

C. decens is a common, semi-domestic mosquito of West Africa, known from Gambia to Transvaal.

Culex (**Culex**) **perfidiosus** Edwards

Culex perfidiosus Edwards, 1914, Bull. Ent. Res., V, 1, p. 72, fig. 12 (♀ ♂; Ilesha and Lagos, S. Nigeria; Lokoja, N. Nigeria; Yumbi, Belgian Congo).

Belgian Congo. — Kinshasa (bred by Dr. Duren). Congo River, on board ship at Lukolela, December 16, 1926.

C. perfidiosus is known thus far from Nigeria and the Belgian Congo only and is probably strictly West African.

Culex (**Culex**) **laurenti** Newstead

Culex laurenti Newstead, 1907, Ann. Trop. Med. Paras., I, p. 24 (♀ ♂; Leopoldville, Belgian Congo). Edwards, 1914, Bull. Ent. Res., V, 1, p. 70, fig. 10 (♂); 1921, *loc. cit.*, XII, p. 344.

Belgian Congo. — Boma, several females taken on board ship in the river, December 2, 1926. Coquilhatville, on board ship, December 19, 1926. A vicious biter.

C. laurenti is known from the Belgian Congo, Zanzibar, Madagascar, and Egypt.

Culex (Culex) andersoni Edwards

Culex andersoni Edwards, 1914, Bull. Ent. Res., V, 1, p. 65, fig. 2 (♀♂; Kabete, Kenya Colony). H. Scott, 1927, *loc. cit.*, XVIII, p. 88 (♂).

Belgian Congo. — Mt. Mikeno, one female in the camp known as Rueru, on the southwestern slope at an altitude of about 9,500 ft., March 1927.

C. andersoni is strictly East African (Kenya and Abyssinia). The only previous records for the Belgian Congo are from Elisabethville in Upper Katanga (altitude: 4,059 ft.), where it was obtained by Mr. C. Seydel in 1926, and from Kalembelembe (at about 4,200 ft.) and Lulenga (5,550 ft.) in the eastern Congo. Kabete, the type locality, is at the altitude of 6,209 ft. In Abyssinia it was obtained by H. Scott at circa 8,000 ft.

Culex (Neoculex) rima Theobald

Culex rima Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. xi (♀; Old Calabar, S. Nigeria); 1901, 'Monogr. Culic.,' II, p. 327, fig. 307 (♀). Edwards, 1911, Bull. Ent. Res., II, p. 265; 1917, *loc. cit.*, VII, 3, p. 226; 1922, *loc. cit.*, XIII, p. 86, figs. *3r* and *3c* (♀♂).

Culiciomyia (?) *insignis* Carter, 1911, Bull. Ent. Res., II, p. 37, figs. 1–2 (♀; Entebbe, Uganda). Macfie and Ingram, 1916, *loc. cit.*, VII, 1, p. 10, fig. 8 (larva and pupa).

Liberia. — Monrovia, July 1926.

Belgian Congo. — Kinshasa (taken by Dr. Duren).

C. rima is a West African species known from Liberia to Uganda.

Culex (Culiciomyia) nebulosus Theobald

Culex nebulosus Theobald, 1901, Liverpool School Trop. Med., Mem. IV, App., p. x (♀; Old Calabar, Chumbele, S. Nigeria); 1901, 'Monogr. Culic.,' II, p. 331 (♀).

Culiciomyia nebulosa Edwards, 1911, Bull. Ent. Res., II, p. 254; 1912, *loc. cit.*, III, pp. 34 and 383 (larva).

Culex (*Culiciomyia*) *nebulosus* Edwards, 1922, Bull. Ent. Res., XIII, p. 89 (♂).

Culex pseudocinereus Theobald, 1901, 'Monogr. Culic.,' II, p. 62, Pl. XXVIII, fig. 112 (♂; Salisbury, Southern Rhodesia).

Pectinopalpus fuscus Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 11, figs. (on pp. 27 and 29) (♂; Obuasi, Gold Coast); 1910, Ann. Mag. Nat. Hist., (8) V, p. 375 (♂); 1910, 'Monogr. Culic.,' V, p. 416, figs. 183–186 (♂).

Belgian Congo. — Kinshasa (bred by Dr. Duren).

C. nebulosus is a common species in West Africa, from Sierra Leone to Uganda, extending eastward to Daressalaam and southward to Southern Rhodesia.

Lutzia tigripes (Daruty de Grandpré)

Culex tigripes Daruty de Grandpré, 1900, 'Les Moustiques.' Edwards, 1911, Bull. Ent. Res., II, p. 261.

Culex tigripes var. *fuscus* Theobald, 1909, Colonial Office (London), Miscell. No. 237, p. 17 (Obuasi, Gold Coast); 1910, 'Monogr. Culic.,' V, p. 394. Edwards, 1912, Bull. Ent. Res., III, p. 380 (larva).

Culex maculicrura Theobald, 1901, 'Monogr. Culic.,' II, p. 34, Pl. XXII, fig. 85 (♀♂; Durban, Natal; British Central Africa; Mombasa, Kenya Colony; Bonny, S. Nigeria; Salisbury, S. Rhodesia; Queensland).

Liberia. — Lenga Town, August 1926.

Belgian Congo. — Kinshasa (bred by Dr. Duren).

The larva and pupa of the var. *fuscus* have been described by W. Wesché (1910, Bull. Ent. Res., I, p. 36, Pl. III, figs. 12–16). The larvae are predaceous and feed upon those of the same or of other species of mosquitoes. At Lenga Town they were found in a hole of a fallen tree in a forest clearing, together with those of *Culex decens* and *C. pruina*. One of the larvae was seen attacking a *Culex* larva. The carnivorous habits were first observed by W. M. Graham at Lagos.

L. tigripes is distributed throughout the Ethiopian Region. It is a semi-domestic mosquito often found breeding in vessels containing clean or foul water in or near human habitations. The adults, however, rarely enter houses and are not aggressive.

Taeniorhynchus (Coquillettidia) metallicus (Theobald)

Culex metallicus Theobald, 1901, 'Monogr. Culic.,' II, p. 63, fig. 180, Pl. XXVI, fig. 102 (♀ ♂; Bonny, S. Nigeria).

Taeniorhynchus metallicus Edwards, 1911, Bull. Ent. Res., II, p. 252. Carter, 1913, Ann. Trop. Med. Paras., VII, p. 588, fig. 6 (♂).

Taeniorhynchus violaceus Theobald, 1908, Third Rept. Wellcome Res. Lab. Khartoum, p. 262 (♀ ♂; Anglo-Egyptian Sudan); 1910, 'Monogr. Culic.,' V, p. 421, figs. 187–190 (♀ ♂).

Chrysoconops nigra Theobald, 1910, 'Monogr. Culic.,' V, p. 434 (♀; Angola).

Uganda. — Entebbe, April 14, 1927.

T. metallicus is a West African mosquito, extending from Southern Nigeria to the Anglo-Egyptian Sudan, Uganda, and Angola.

Taeniorhynchus (Coquillettidia) aurites Theobald

Taeniorhynchus aurites Theobald, 1901, 'Monogr. Culic.,' II, p. 209, figs. 253–254, Pl. XXII, fig. 88 (♀; Bonny, S. Nigeria). Edwards, 1911, Bull. Ent. Res., II, p. 252; 1912, *loc. cit.*, III, p. 25.

Chrysoconops fraseri Theobald, 1911, 'Novae Culicidae,' I, p. 22, figs. 12–16 (♀ ♂; Kampala, Uganda).

Belgian Congo. — Congo River, on board ship near Lulonga, December 21, 1926, attracted by light.

Uganda. — Entebbe, April 14, 1927.

T. aurites is a beautiful mosquito, apparently restricted to the rain forests of the West African Subregion.

Taeniorhynchus (Coquillettidia) versicolor Edwards

Taeniorhynchus versicolor Edwards, 1913, Bull. Ent. Res., IV, 1, p. 50 (♀ ♂; Nairobi, type locality, Kenya Colony; Mbarara and Kabula,[1] Uganda).

Uganda. — Kabale, at the altitude of 6,400 ft., April 9, 1927.

T. versicolor is strictly East African and has not yet been found in the Belgian Congo, where it should be looked for in the Kivu Highlands.

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[1] Possibly Kabula is a misspelling for Kabale.

Taeniorhynchus (Coquillettidia) fuscopennatus Theobald

Taeniorhynchus fuscopennatus Theobald, 1903, 'Monogr. Culic.,' III, p. 265, figs. 141–143, Pls. XIII and XIV (♀ ♂; Entebbe, Uganda). Edwards, 1911, Bull. Ent. Res., II, p. 253; 1912, *loc. cit.*, III, p. 26.

Culex drymoecius Speiser, 1909, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' II, 10, 4, p. 42 (♀; Kibonoto, Kilimanjaro, 2,000 m.; and Mombo, Usambara; all in Tanganyika Territory).

Chrysoconops bakeri Theobald, 1911, 'Novae Culicidae,' I, p. 19, figs. 9–11 (♀ ♂; Kampala, Uganda).

BELGIAN CONGO. — Nya Ngezi, in the valley of the Ruzizi River, at an altitude of about 1,300 m. (4,290 ft.), February 3, 1927.

UGANDA. — Kisolo, at about 5,000 ft. altitude, several females in the rest-house, biting man in the evening, April 3, 1927. Kabale, 6,400 ft., April 9, 1927. Entebbe, April 14, 1927. Kampala, April 13, 1927.

T. fuscopennatus appears to be restricted to East Africa. Seydel (1929, Rev. Zool. Bot. Afric., XVIII, p. 31) calls attention to the fact that this is one of the very few mosquitoes found above 2,000 m. in the Kivu region. He records it from the northwestern shore of Lake Tanganyika (Mwaba and Musingiro), from Kisenyi, and from Tshibinda (10 kilom. west of Lake Kivu, at the altitude of 2,100 m.).

Taeniorhynchus (Mansonioides) uniformis (Theobald)

Panoplites uniformis Theobald, 1901, 'Monogr. Culic.,' II, p. 180, Pl. XXX, fig. 118 (♀; Quilon, Travancore, S. India, and Taiping, Perak).

Mansonioides uniformis Edwards, 1913, Bull. Ent. Res., IV, 1, p. 51, fig. 1.

Panoplites africanus var. *reversus* Theobald, 1901, 'Monogr. Culic.,' II, p. 189 (♀; Zomba, Nyasaland).

Panoplites australiensis Giles, 1902, 'Handbook of Gnats or Mosquitoes,' 2d Ed., p. 355 (♀; Burpengary, Queensland).

BELGIAN CONGO: Congo River, on board ship at Yumbi, December 15, 1926. Kinshasa (taken by Dr. Duren). Uvira, January 26, 1927. Luvungi, January 30, 1927.

The larva, although not yet described, has probably habits similar to those of the closely related *T. africanus* (see below).[1] In Abyssinia this species has been found up to 6,000 ft. altitude.

T. uniformis is distributed throughout Tropical Africa, from Sierra Leone to the Bahr-el-Ghazal, Abyssinia, Kenya Colony, Mozambique, and Angola. It has been found outside Africa, throughout the Oriental Region as far as New Guinea, northern Australia, Queensland, and the Solomon Islands.

Taeniorhynchus (Mansonioides) africanus Theobald

Panoplites africanus Theobald, 1901, 'Monogr. Culic.,' II, p. 187 (♀; Fort Johnston and Chiromo, Nyasaland; Lagos and Old Calabar, S. Nigeria).

Mansonioides africanus Edwards, 1912, Bull. Ent. Res., III, p. 378, fig. 3 (larva); 1913, *loc. cit.*, IV, 1, p. 52, fig. 2. Ingram and Macfie, 1917, *loc. cit.*, VIII, p. 137, fig. 1, Pl. I, figs. 2–3 (larva).

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[1] Dr. Duren has recently (1929, Rev. Zool. Bot. Afric., XVII, 2, pp. [26] – [27]) published a note on the larvae of *Mansonioides* found attached to the rootlets of *Pistia stratiotes*, at Boma, Belgian Congo. Unfortunately he does not state which species was bred from them.

Mansonioides uniformis Ingram, 1912, Bull. Ent. Res., III, p. 75, fig. 1 (larva and pupa) (not of Theobald).

Taeniorhynchus (*Mansonioides*) *africanus* S. L. M. Summers Connal, 1928, Bull. Ent. Res., XIX, p. 293, Pl. XIII (pupa).

Mansonia major Theobald, 1903, 'Monogr. Culic.,' III, p. 270, figs. 145–147, Pl. XIII (♀; Bahr-el-Ghazal, Anglo-Egyptian Sudan).

Belgian Congo. — Kinshasa (taken by Dr. Duren). Congo River, one of the most common mosquitoes on board ship, specimens having been taken at Mistandungu, Lukolela, Coquilhatville, and Bumba, December 1926. Kisenyi, on the northern shore of Lake Kivu, at the altitude of 1,460 m. (4,818 ft.), February 1927.

The remarkable larva lives in swamps or in the quiet backwaters of rivers, attached by means of the enlarged and toothed valves of the siphon to the roots of aquatic plants, especially of water lettuce, *Pistia stratiotes* Linnaeus. Mrs. Connal, in Nigeria, observed both larva and pupa attached by the siphon to the lower surface of the leaves of duckweed (*Lemna*). The larva remains below the surface of the water, taking its air from the vessels of the plants.[1]

T. africanus has much the same distribution in Africa as *T. uniformis*. Outside the Ethiopian Region, Edwards has recorded it from Queensland (1924, Bull. Ent. Res., XIV, p. 365).

Either this species or its relative, *T. uniformis*, has been proved to be an effective carrier of the human blood parasite, *Wuchereria bancrofti* (Cobbold), in certain parts of tropical Africa.

Tribe Anophelini

Anopheles (Anopheles) mauritianus Daruty de Grandpré var. **paludis** Theobald

Anopheles paludis Theobald, 1900, Repts. Malaria Comm. Roy. Soc., p. 75 (♀; Sierra Leone); 1901, 'Monogr. Culic.,' I, p. 128, fig. 26 (♀).

Anopheles mauritianus var. *paludis* Edwards, 1927, in A. M. Evans, Liverpool School Trop. Med., Mem., (N. S.) No. 3, p. 51 (♀). Edwards, 1928, Bull. Ent. Res., XVIII, 3, p. 268.

Belgian Congo. — Kinshasa (taken by Dr. Duren), where the species is much rarer than *A. gambiae*. Congo River, on board ship, near Bolobo, near Nouvelle-Anvers, and at Barumbu, December 1926, and January 1927.

The early stages of *A. mauritianus* have been described by Hill and Haydon (1907, Ann. Natal Mus., I, pp. 146–152) and Wesché (1910, Bull. Ent. Res., I, 1, p. 24, Pl. VI, figs. 14–21); the pupa also by Ingram and Macfie (1917, Bull. Ent. Res., VIII, 1, p. 76, fig. 2). The larvae are common in swamps where they hide among the leaves of floating weeds, especially of the water lettuce, *Pistia stratiotes* Linnaeus. Occasionally, however, they may be found elsewhere in stagnant water, even in roadside puddles.

In various forms *A. mauritianus* is found throughout the Ethiopian Region, as well as in Madagascar, Mauritius, Tripoli, Lower Egypt, and Palestine. In Abyssinia it has been taken at an altitude of circa 7,500 ft. In the Belgian Congo it is known in the typical form and in the varieties *ziemanni* Grünberg and *paludis* Theobald; but the last-named is by far the most common form there.

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[1] Dr. J. Schwetz has recently published some interesting observations of the larval habits of *T. africanus* and *T. aurites* in the Belgian Congo (1930, Rev. Zool. Bot. Afric., XVIII, pp. 311–329).

A. mauritianus does not appear to be an effective carrier of malaria.

Anopheles (Myzomyia) gambiae Giles

Anopheles gambiae Giles, 1902, 'Handbook of Gnats or Mosquitoes,' 2d Ed., p. 511 (♀; Gambia) Christophers, 1924, Indian Med. Res. Mem., No. 3, p. 60.

Anopheles costalis Giles, 1900, Liverpool School Trop. Med., Mem. II, App. I, p. 49 (♀ ♂). Theobald, 1901, 'Monogr. Culic.,' I, p. 157, figs. 39–42, Pl. IV, fig. 15 (♀ ♂). Ziemann, 1902, Arch. f. Schiffs- u. Tropenhyg., VI, p. 361. A. M. Evans, 1927, Liverpool School Trop. Med., Mem., (N. S.) No. 3, p. 17, figs. 8*D* and 8*G*, Pl. I and Pl. VI, fig. 1 (♀). (Not *Anopheles costalis* Loew, 1866).

Pyretophorus costalis Wesché, 1910, Bull. Ent. Res., I, 1, p. 20, Pl. V, figs. 19–23, Pl. VI, figs. 1–6 (larva and pupa).

Anopheles merus Dönitz, 1902, Zeitschr. f. Hyg., XLI, p. 77, Pl. I, fig. 12 (♀ ♂; Daressalaam and Mballa Plain, Tanganyika Territory, and Franzfontein, S. W. Africa).

Anopheles gracilis Dönitz, 1902, Zeitschr. f. Hyg., XLI, p. 76, Pl. II, fig. 16 (♀ ♂; Togo and Cameroon).

Anopheles costalis var. *melas* Theobald, 1903, Liverpool School Trop. Med., Mem. X, App., p. ii (♀; Gambia).

Anopheles arabiensis Patton, 1905, Jl. Bombay Nat. Hist. Soc., XVI, 4, p. 625, Pl. A, figs. 1–3 (♀ ♂; between Sheik Othaman and D'thala, S. Arabia).

This is the species generally called *Anopheles costalis* in the literature; but Loew's *A. costalis* was certainly different.

LIBERIA. — Du River, Camp No. 3, bred from larvae and common in the tents, July 1926. Gbanga, a few adults taken inside tents in the early morning, September 1926. This species was observed biting at 8 A.M.

BELGIAN CONGO. — Kinshasa (bred by Dr. Duren), the common anopheline in that locality.

A. gambiae is the African anopheline most closely associated with man and may be regarded as a true domestic mosquito. It breeds preferably in small collections of water, freely exposed to the sun. Small rain pools, tree holes containing rain-water, discarded tin cans, roadside ditches, and depressions in the beds of dried-up streams are favorite breeding places. The larvae may even be found in domestic containers of water. At Monrovia they were common in wells. At our camp on the Du River, numerous larvae were found in an open pond of the forest clearing (No. 474), together with those of *Culex consimilis*. The adults occur in human habitations and bite during the daytime as well as at night.

A. gambiae is common throughout the Ethiopian Region, and extends into Mauritius and southern Arabia. In the mountains of Abyssinia it reaches the altitude of 7,000 ft. It is probably the chief carrier of malaria wherever it occurs. Experimentally it has been infected with all three species of malaria parasites. In addition it is a potential carrier of the human blood parasite, *Wuchereria bancrofti* (Cobbold), as shown by Annett, Dutton, and Elliott in West Africa.

Anopheles (Myzomyia) nili (Theobald)

Myzomyia nili Theobald, 1905, First Rept. Wellcome Res. Lab. Khartoum, (1904), p. 66, Pl. I, figs. 3–4; Pl. III, fig. 2; Pl. V, fig. 3 (♀; Jebel Akmet on the White Nile and Middle Sobat, Anglo-Egyptian Sudan).

Anopheles (*Myzomyia*) *nili* Christophers, 1924, Indian Med. Res. Mem., No. 3, p. 45. Blacklock and Evans, 1926, Ann. Trop. Med. Paras., XX, p. 80, figs. 9–10 (description of a larva probably of this species). A. M. Evans, 1927, Liverpool School Trop. Med., Mem., (N. S.) No. 3, p. 28, Pl. IV, fig. 12 (♀♂).

Myzomyia unicolor Grünberg, 1905, Zool. Anzeiger, XXIX, p. 379, fig. 3 (♀; Kete Kratje, Togo).

Belgian Congo. — Congo River, one of the common anophelines on board ship, specimens having been taken near Nouvelle-Anvers, above Bumba, below Basoko, at Basoko, and at Barumbu, December 1926 and January 1927.

A. nili is mainly West African, although it is also known from the Sudan, Nyasaland, and Zululand. Miss Evans (1927) does not include the Belgian Congo in the distribution, but J. Schwetz (1927) has given several records from that territory.

A. nili does not appear to be domestic in its habits, adults being very rarely taken indoors. The larvae, which are not yet known with certainty, are probably to be looked for in large swamps. *A. nili* is a carrier of malaria at Stanleyville, according to J. Schwetz (1929, Trans. R. Soc. Trop. Med. Hyg., XXII, 5, p. 460).

Anopheles (**Myzomyia**) **marshalli** (Theobald) var. **moucheti** Evans

Anopheles (*Myzomyia*) *marshalli* var. *moucheti* A. M. Evans, 1925, Ann. Trop. Med. Paras., XIX, p. 211, figs. 1–2 (♀♂; Buta, Belgian Congo); 1927, Liverpool School Trop. Med., Mem., (N. S.) No. 3, p. 38, figs. 8*B* and 9 (♀♂); 1929, Ann. Trop. Med. Paras., XXIII, 3, p. 415, figs. 1*A*, 2*B*, 2*D*, 3*B*, 4*A-B*, 5*A*, and 6*B* (larva and pupa).

Belgian Congo. — Congo River, one of the common species on board ship, specimens having been obtained at Coquilhatville, downstream from Coquilhatville, near the confluence of the Lulonga River, and near Nouvelle-Anvers, in December 1926. It was observed that this species is active throughout the day, biting at all hours.

This variety appears to be the usual Congo representative of *A. marshalli*, a species widely distributed in the Ethiopian Region and also found in Madagascar.

The favorite breeding places appear to be the slowly running or stagnant water of pools or backwaters of rivers, where the larvae are often hidden among water lettuce, *Pistia stratiotes* Linnaeus. Ingram and Macfie (1917, Bull. Ent. Res., VIII, pp. 75 and 135) have described the larva and pupa of the typical form. According to J. Schwetz (1929, Trans. R. Soc. Trop. Med. Hyg., XXII, 5, p. 460), the var. *moucheti* transmits malaria at Stanleyville.

Anopheles (**Myzomyia**) **funestus** Giles

Anopheles funestus Giles, 1900, Liverpool School Trop. Med., Mem. II, App. I, p. 50 (♀♂; Freetown, Sierra Leone). W. Mansfield-Aders, 1920, Bull. Ent. Res., X, 3, p. 330, fig. 1 (larva). Edwards, 1922, *loc. cit.*, XIII, p. 91 (larva).

Anopheles (*Myzomyia*) *funestus* Christophers, 1924, Indian Med. Res. Mem., No. 3, p. 47. A. M. Evans, 1927, Liverpool School Trop. Med., Mem., (N. S.) No. 3, p. 29, figs. 6*A* and 6*C*, Pl. II, figs. 4–5, and Pl. IV, figs. 9–10 (♀♂; larva).

Anopheles kumasii Chalmers, 1900, The Lancet, Vol. II, p. 1262 (♀♂; Kumasi, Gold Coast).

Anopheles hebes Dönitz, 1902, Zeitschr. f. Hyg., XLI, p. 84, Pl. I, fig. 1 (♀; Daressalaam and Mballa Plain, Tanganyika Territory; Insiza, S. W. Africa).

Anopheles funestus var. *subumbrosus* Theobald, 1903, Liverpool School Trop. Med., Mem. X, App., p. iv (Gambia).

Liberia. — Gbanga, taken repeatedly inside tents in the early morning and the most common anopheline in that locality.

A. funestus is widely distributed throughout the Ethiopian Region and occurs in Madagascar also.

The adults are domestic insects, the females being commonly found in dwellings during the daytime. The breeding places, however, are generally some distance away from houses. The larvae are found preferably at the edges of slowly running streams, where they hide among the floating vegetation. I found that, in Katanga, this mosquito survives the dry season in the adult stage (J. Bequaert, 1913, Rev. Zool. Afric., III, p. 9).

A. funestus is one of the important carriers of malaria. Experimentally it has been infected with *Plasmodium falciparum* Welch (aestivo-autumnal malaria) and with *P. malariae* Laveran (quartan malaria).

CHIRONOMIDAE

Subfamily Ceratopogoninae[1]

This subfamily comprises many minute midges found in all parts of the world, the majority of them being of no economic importance. The blood-sucking species, — at least those that attack man or other mammals — are known as punkies or (more improperly) as sand-flies and belong to five genera: *Culicoides* Latreille (including *Forcipomyia* Meigen), *Lasiohelea* Kieffer, *Haemophoructus* Macfie, *Leptoconops* Skuse, and *Acanthoconops* Carter. With the exception of *Haemophoructus*, these genera are all represented in the Ethiopian Region. Records of species of other genera, such as *Johannsenomyia* Malloch (= *Johannseniella* Williston) or *Ceratopogon* Meigen, given in the literature as attacking man or mammals appear to be based either upon erroneous observations or upon misidentifications; at any rate, they need confirmation.

Punkies often appear in such large numbers and are such persistent biters that they are a very troublesome pest; the more so since their minute size lets them pass through the usual anti-mosquito screens. Until recently, however, they were not known to carry the germ of any human or animal disease. In 1927, N. A. D. Sharp demonstrated that the parasitic worm of man, *Acanthocheilonema perstans* (Manson), undergoes its larval development in *Culicoides austeni* Carter, Ingram and Macfie. A brief account of his observations is given below under that species of *Culicoides*.

Females of an interesting midge of the subfamily Ceratopogoninae were discovered at Gbanga, Liberia, in September 1926, fixed by means of the proboscis to the under side of the wings of dragon-flies. The dragon-flies belonged to two species, *Trithemis arteriosa* (Burmeister) and *Orthetrum microstigma* Ris (both identified by Dr. P. P. Calvert, of Philadelphia). According to Mr.

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[1] The few midges of this group, collected by the Harvard African Expedition, have been named by Mr. F. W. Edwards, of the British Museum (Natural History), whose kind help is herewith gratefully acknowledged.

Edwards the midge is an undescribed species, probably of a new genus. It is remarkable in having no claws, while the empodium has a most peculiar structure. There seems to be only one previous record of midges attacking dragonflies. E. Jacobson, in Sumatra, observed on two occasions midges fixed to the wings of these insects, in one case of the species *Anax magnus* Rambur. The midge has been described by de Meijere as *Ceratopogon aeschnosuga* (1923, Tijdschr. v. Entom., LXVI, p. 137, fig. 1; ♀).[1] This species likewise lacks claws, and probably belongs in the same genus as the Liberian one.

Culicoides grahamii Austen

Culicoides grahamii Austen, 1909, Ann. Mag. Nat. Hist., (8) III, p. 280 (♀; Obuasi, Ashanti, Gold Coast); 1909, 'Illustr. African Blood-Suck. Flies,' p. 7, Pl. I, fig. 3 (♀); 1912, Bull. Ent. Res., III, p. 99. Carter, Ingram and Macfie, 1920, Ann. Trop. Med. Paras., XIV, p. 263, figs. 5*a-b*, 26, and 27*a*, *c*, *e*, *g* (♀♂); 1924, Bull. Ent. Res., XV, p. 184.

Culicoides habereri Becker, 1909, Jahresh. Ver. Vaterl. Naturk. Württemberg, p. 289, Pls. VIII–IX (♀; Sanaga River near Abunamballa, southern Cameroon).

LIBERIA. — Lenga Town, August 17, 1926, biting man in the village at 6 A.M.

BELGIAN CONGO. — Kisenyi, on the northern shore of Lake Kivu, 1,460 m., February 13, 1927, biting man at 7 A.M. Burunga, 1,800 m., February 17, 1927, biting man about 9 A.M. In the Semliki Valley, May 17, 1927, biting man. Slopes of Mt. Ninagongo at 2,300 m., February 15, 1927, biting man at 9 A.M.

A most vicious and troublesome insect, which bites in broad daylight, though preferably in the evening about dusk and in the early morning. It is extremely abundant in the forested part of the Semliki Valley (Bwambwa Country). Carter, Ingram, and Macfie, in Sierra Leone, found the larvae in decaying vegetable matter at the base of banana stumps.

C. grahamii is the commonest and most widely distributed of the African punkies, being known from Sierra Leone to Uganda and Angola.

In British Cameroon, N. A. D. Sharp (1928, Trans. Roy. Soc. Trop. Med. Hyg., XXI, 5, pp. 371–396) found that the embryos of the worm, *Acanthocheilonema perstans* (Manson), develop in *C. grahamii* during at least three days. Probably this midge also may act as an intermediary host of the parasite.

Culicoides austeni Carter, Ingram and Macfie

Culicoides austeni Carter, Ingram and Macfie, 1920, Ann. Trop. Med. Paras., XIV, p. 261, figs. 2, 3*a*, 6*d*, 20*l*, and 25 (♀♂; Accra and Sekondi, Gold Coast). Ingram and Macfie, 1921, *loc. cit.*, XV, p. 314 (larva and pupa). Macfie, 1926, Bull. Ent. Res., XVI, p. 357 (♂). Sharp, 1928, Trans. Roy. Soc. Trop. Med. Hyg., XXI, 5, p. 379, fig. 2 (♀).

BELGIAN CONGO. — Kifuku near Banana, in the estuary of the Congo, July 1921, biting man (J. Rodhain).

This species was found in Sierra Leone, by Ingram and Macfie, breeding in muddy pools, in crab-holes and in the water gathered by the leaves of water-lettuce, *Pistia stratiotes* Linnaeus. It appears to be as widely distributed as *C. grahamii*, being known at present from Sierra Leone, the Gold Coast, Cameroon, the Lower Belgian Congo, and the coast of Tanganyika Territory (Daressalaam).

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[1] Jacobson, E. 1923. 'Micro-Dipteren als Ectoparasiten anderer Insekten.' Tijdschr. v. Entom., LXVI, pp. 135–136.

de Meijere, J. C. H. 1923. '*Ceratopogon*-Arten als Ectoparasiten anderer Insekten.' Tijdschr. v. Entom., LXVI, pp. 137–142.

In recent years it has been shown that *C. austeni* is the intermediary host of *Acanthocheilonema perstans* (Manson), a parasitic roundworm of man, which has also been reported from chimpanzee and gorilla. This parasite, also known as *Filaria perstans* or *Dipetalonema perstans*, lives as adult in the connective tissue, especially of the mesentery. It is very common throughout tropical Africa (about 92 per cent of the native population are infected in British Cameroon) and it has also been reported from British Guiana, and North Africa (Algeria). The embryos, or microfilariae, are found in the peripheral blood both by day and by night. The parasite usually causes no pathological symptoms in man. A. Hodges (1902, Jl. Trop. Med., V, pp. 293–300), in Uganda, found that these embryos undergo a partial development in certain mosquitoes, such as *Aëdes aegypti* (Linnaeus), *Aëdes vittatus* (Bigot) (≐ *sugens* of authors), *Anopheles gambiae* Giles (= *costalis* of authors), *Taeniorhynchus fuscopennatus* Theobald, *Mansonioides uniformis* Theobald, and *Panoplites* sp.; but when the larvae reach the thoracic muscles they do not develop further. Fülleborn (1908, Arch. Schiffs-u. Tropenhyg., XII, Beiheft 9, p. 34) also observed a partial development of the embryos in *Anopheles maculipennis* Meigen, in Germany. None of these mosquitoes, however, can act as true intermediary hosts.

The true life-history was elucidated by N. A. D. Sharp, who carried on experiments with *Culicoides austeni*, in British Cameroon. He found that this midge occurs during the wet season only; it feeds principally at night between 10 P. M. and 2 A.M. and bites in the dark only. If the midge is allowed to bite a man having microfilariae of *A. perstans* in the peripheral circulation, the embryos develop within six hours after ingestion into larvae lying either in the stomach wall or in the fat body of the insect. These larvae gradually change in appearance as they migrate to other tissues. They reach the muscles of the thorax about twenty to thirty hours after ingestion, and the head and neck of the fly by the seventh day. Soon afterward they travel to the proboscis, where they lie in the labrum-epipharynx and eventually burst through the wall of the labrum after bulging it out of the proboscis. They emerge from the labrum on the eighth to tenth day after ingestion. At Mamfe, Cameroon, about seven per cent of the wild *C. austeni* were found infected with this worm.[1]

A third species of *Culicoides*, *C. inornatipennis* (Austen), has been found in the Marungu Plateau (alt. 1,950 m.) of Katanga, by J. Schwetz (1927, Bull. Soc. Path. Exot. Paris, XX, p. 190).

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[1] Sharp, N. A. D. 1927. 'Development of *Microfilaria perstans* in *Culicoides grahami;* a preliminary note.' Trans. Roy. Soc. Trop. Med. Hyg., XXI, 1, p. 70.

1928. '*Filaria perstans;* its development in *Culicoides austeni*.' Trans. Roy. Soc. Trop. Med. Hyg., XXI, 5, pp. 371–396, 2 Pls.

SIMULIIDAE

The Simuliidae, known in the vernacular as black-flies or buffalo-gnats, are of almost world-wide distribution, since they extend from the equator to near the Arctic circle and are found from sea-level to an altitude of at least 9,000 ft. Some 330 species have been described to date, divided among the several zoögeographical regions as follows: 125 Palaearctic, 53 Nearctic, 80 Neotropical, 24 Ethiopian (including 5 species from the Malagasy Subregion), 26 Oriental, and 24 Australasian. The females alone bite and, as they often occur in extraordinary numbers, they are in spite of the small size among the worst insect pests in many parts of the world. It is probable that their rôle as carriers of contagious diseases and parasites is more important than realized. At present, however, it has been demonstrated beyond doubt in one case only, *viz.*, for the African parasitic worm of man, *Onchocerca volvulus* (Leuckart).

In various countries, even outside the tropics, black-flies may become so numerous at certain seasons, that they render those regions uninhabitable for man and beast alike. Their attacks are the more dreaded because they often induce severe symptoms or are even followed by death. The notorious Golubatz fly of eastern Central Europe, *Simulium columbaczense* (Schönbauer), causes every year severe losses in domestic animals. The bite of some other European species also appears to be dangerous at times. Years ago, swarms of a North American species, *Eusimulium pecuarum* (Riley), used to cause the death of cattle and horses in the lower Mississippi Valley.[1] According to Dyar and Shannon (1927, Proc. U. S. Nat. Mus., LXIX, Art. 10, p. 19), no serious outbreaks have occurred during the past thirty to forty years. Another species, *Simulium occidentale* Townsend (*S. meridionale* of authors), known as the "cholera gnat" or "turkey gnat," is widely distributed in the United States. In former years (about 1888) it was claimed to cause the death of chickens and turkeys, producing symptoms similar to cholera (Dyar and Shannon, 1927, *loc. cit.*, p. 33). Recently G. P. Walker has reported that, in Nova Scotia and New Brunswick, large numbers of *Eusimulium aureum* var. *bracteatum* (Coquillett) bite geese and ducks preferably to man. He believes that in one case the bites were responsible for the death of young geese.[2]

The grave symptoms or death that sometimes follow the bite of black-flies appear to be due to a toxic substance secreted by the flies and injected into the blood and tissues of the animals. At any rate, no specific germ has thus far been found associated with these morbid conditions. The exact nature of the poison is as yet unknown. Most animals seem to become immune to the poison when they are gradually exposed to the bites of the black-flies. According to Wilhelmi's "climatic and immunity theory," the Simuliidae become dangerous only when they hatch in enormous numbers following sudden rises of the

[1] Riley, C. V. 1885. 'The southern buffalo gnat (*Simulium* sp.).' Rept. Entomologist U. S. Dept. Agric. for 1884, pp. 340–345.

1887. 'Report of the Entomologist.' Rept. U. S. Comm. Agric. for 1886, pp. 459–592, Pls. I–XI.

[2] Walker, G. P. 1927. 'A black-fly (*Simulium bracteatum*) fatal to goslings.' Canad. Entom., LIX, p. 123.

temperature in the spring and then attack animals that have not become gradually immune to black-fly poison.[1]

As a rule, in man severe symptoms or death occur only in persons who are hypersensitive to the bites or when black-flies are unusually numerous. Fatal cases are very rare, the symptoms being more of a general nature, such as a lowering of the body temperature or the appearance of skin swellings or papules over extended areas of the body.[2]

Of the several specific helminths that infect man in tropical Africa, one of the more common in certain areas is *Onchocerca volvulus* (Leuckart), a roundworm of the family Filariidae. It is a strictly human parasite, which lives as adult in a subcutaneous fibroma or tumor of fibrous connective tissue. The embryos, or microfilariae, are likewise found in these tumors; but eventually they wander in the derm of the skin where they are sometimes blamed for the symptoms known as "filarial itch." Otherwise the effects of this parasite upon the host are generally very mild or not noticed. *O. volvulus* has been found throughout the densely forested, humid parts of the West African Subregion. There are records from Sierra Leone, Dahomey, the Gold Coast, Togo, Lagos, Cameroon, the French Congo, the Belgian Congo, and Uganda. Cases were observed in Liberian natives by the Harvard African Expedition. (See Chapter XVII, page 240.)

While the true mode of transmission of this worm was elucidated only recently, it was long ago suspected from analogy that some biting arthropod was involved. Brumpt first suggested tsetse-flies, tabanids or simuliids as possible carriers, but he soon recognized that the rôle of the tsetse-flies at least was improbable. He pointed out that the localization of the parasite along rivers seemed to exclude mosquitoes.[3] Rodhain and Van den Branden failed to infect the yellow fever mosquito, *Aëdes aegypti* (Linnaeus), and the tropical bedbug, *Cimex hemipterus* (Fabricius), with the microfilariae found in the subcutaneous tumors.[4] Following the discovery that the microfilariae migrate to the derm, Blanchard and Laigret fed the tick, *Ornithodoros moubata* (Murray), a species of bedbug (probably *Cimex hemipterus*), a species of *Simulium* (captured near Brazzaville, French Congo), the blood-sucking maggots of *Auchmeromyia luteola* (Fabricius), as well as leeches, upon the skin of natives infected with *O. volvulus* tumors. In most of their experiments a few microfilariae were found in the ticks, flies and leeches immediately after the infecting feed. As a rule the parasites disappeared soon afterward, but in the ticks they were found alive after twelve days. In no case, however, was any definite development of the worm observed. The experiments with *Simulium* were carried out with very few flies (twenty in all), none of which survived until the next day. The only interesting conclusion drawn from these experiments was that the blood-sucking arthropods attract the microfilariae scattered in the derm to the point of the bite.[1]

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[1] Wilhelmi, J. 1920. "Die Kriebelmückenplage.' (Jena), 246 pp.

Wilhelmi, J. and Saling, T. 1928. 'Stand und Aufgaben der Simuliidenforschung.' Zeitschr. Wiss. Zool., CXXXII, pp. 329–354.

[2] See the Medical Report of the Hamilton Rice 7th Expedition to the Amazon, 1926, pp. 209–210, where I have given an account of the black-fly pest in South America.

[3] Brumpt, E. 1903. 'Du rôle des mouches tsé-tsé en pathologie exotique.' C. R. Soc. Biol. Paris, LV, pp. 1496–1498.

1904. 'A propos de la *Filaria volvulus* Leuckart.' Rev. Méd. Hyg. Trop., I, pp. 43–46.

[4] Rodhain, J. and Van den Branden, F. 1916. 'Recherches diverses sur la *Filaria* (*Onchocerca*) *volvulus*.' Bull. Soc. Path. Exot. Paris, IX, pp. 186–198.

The life-cycle of *O. volvulus* in the insect vector was finally elucidated by Blacklock in Sierra Leone. He found that in the Konno District some forty-two per cent of the natives showed microfilariae in the skin. The prevalence of *Eusimulium damnosum* being noted at the time, some of these flies were captured shortly after they had started feeding upon natives. Upon dissection, of seven hundred and eighty flies, twenty (or 2.6 per cent) showed in the gut microfilariae with all the morphological characters of *O. volvulus* larvae. Of 1,320 black-flies captured in the same manner fifteen (or one per cent) presented in the thorax developmental forms of a nematode at various stages. By feeding wild flies on selected natives known to harbor *O. volvulus* and by keeping the flies alive as long as possible afterward, the percentage of thorax infections was considerably increased. In one experiment, of twenty-two flies dissected later than two days after biting an infected native, eighteen proved to be infected in the thorax. It was also shown that the larvae later migrate from the thorax to the head of the fly and that they eventually gather in the labium. On several occasions the larvae were seen breaking spontaneously through the membranous labella at the tip of the labium. It is probably in this fashion that they enter the skin of man when an infected fly bites. The complete life-cycle in *Eusimulium damnosum*, from the time of feeding on an infected person to the appearance of larvae in the labium, was seven days or more, depending upon the temperature.[2]

Some other parasitic infections of man or animals have at one time or other been attributed to the bites of black-flies, but without experimental proof. Thus Railliet states that Simuliidae transmit *Setaria equina* (Abildgaard), a helminth parasite of equines, but gives no evidence in support of this view.[3] Dry describes a filarial infection of man in Kenya Colony which he refers (perhaps incorrectly) to *Onchocerca volvulus* and which, he claims, might be carried by a local black-fly, *Simulium neavei* Roubaud.[4] In certain mountainous areas of Guatemala and southern Mexico, a related helminth, *Onchocerca caecutiens* Brumpt, causes a peculiar dermatosis (''*erisipela de la costa*''), sometimes accompanied by ocular trouble. Nothing definite is known regarding its mode of transmission, although some biting arthropod is probably the vector. Robles suggests as possible carriers two species of black-flies, locally called ''coffee-flies'' and tentatively named *Simulium samboni* Jennings and *S. dinellii* Joán.[5] These are the only common blood-sucking flies in the coffee-growing belt of Guatemala, between the altitudes of 600 m. and 1,200 m., where the worm is prevalent in man.[1] In this case, however, Calderón's more recent work rather seems to incriminate a species of *Culex* as the transmittor.[2]

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[1] Blanchard, M. and Laigret, J. 1924. 'Recherches sur la transmission d'*Onchocerca volvulus* par divers parasites hématophages.' Bull. Soc. Path. Exot. Paris, XVII, pp. 409–417.

[2] Blacklock, D. B. 1926. 'The development of *Onchocerca volvulus* in *Simulium damnosum*.' Ann. Trop. Med. Paras., XX, 1, pp. 1–48, Pls. I–IV.

1926. 'The further development of *Onchocerca volvulus* Leuckart in *Simulium damnosum* Theob.' Ann. Trop. Med. Paras., XX, 2, pp. 203–218, Pl. XIX.

1927. 'The insect transmission of *Onchocerca volvulus* (Leuckart, 1893), the cause of worm nodules in man in Africa.' Brit. Med. Jl., (1927), vol. I, pp. 129–133.

[3] Railliet, A. 1895. 'Traité de zoologie médicale et agricole.' 2d. Ed., (Paris).

[4] Dry, F. W. 1921. 'Trypanosomiasis in the absence of tsetses, and a human disease possibly carried by *Simulium* in Kenya Colony.' Bull. Ent. Res., XII, pp. 233–238, Pls. VII–VIII.

[5] These identifications are most probably erroneous.

The hypothesis propounded at one time by Sambon and others, that there might be some causal connection between pellagra and the bites of Simuliidae, has now been completely discarded.[3] Likewise there is no proof and but little probability that black-flies act as the vectors of certain forms of cutaneous leishmaniasis.

Only two species of Simuliidae have been definitely recorded thus far from the Belgian Congo: *Eusimulium damnosum* (Theobald) and *Eusimulium dentulosum* (Roubaud) (1915, Bull. Soc. Ent. France, p. 294, figs. 1–2; ♀; Butagu Valley, on the western slope of Mt. Ruwenzori, at 2,000 m.; known also from Mt. Kenya and Mt. Elgon); but very likely others will be found there. Newstead, Dutton and Todd (1907, Ann. Trop. Med. Paras., I, p. 36) list an undetermined species from Leopoldville, M'swata and Batikalela, which, they say, bites freely and when crushed emits a peculiar "bedbug-like" odor.

Eusimulium damnosum (Theobald)

Text Figure No. 4

Simulium damnosum Theobald, 1903, Repts. Sleeping Sickness Comm. Roy. Soc., No. III, p. 40 (sex not given, but evidently ♀; Region of Jinja, Uganda, on the right bank of the Nile). Austen, 1906, Second Rept. Wellcome Res. Labor. Khartoum, p. 52. Roubaud, 1906, Bull. Mus. Hist. Nat. Paris, XII, p. 140 (♀); 1907, C. R. Ac. Sci. Paris, CXLIV, p. 716 (larva and pupa supposedly of this species). Newstead, Dutton and Todd, 1907, Ann. Trop. Med. Paras., I, p. 36. H. H. King, 1909, Third Rept. Wellcome Res. Labor. Khartoum, (1908), p. 208, Pl. XXIII, figs. 3, 5, and 7 (♀, larva and pupa). Austen, 1909, Illustr. African Blood-Suck. Flies, p. 26, Pl. I, fig. 6 (♀). H. H. King, 1911, Fourth Rept. Wellcome Res. Labor. Khartoum, vol. B, p. 125, Pl. VI, fig. 8 (♀). Pomeroy, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 79, Pl. III, fig. 4 and Pl. IV, fig. 5 (♂ and pupa). Jojot, 1921, Ann. Méd. Pharm. Colon., XIX, p. 426. Hannington, 1922, Nigeria Ann. Med. Sanit. Rept. (1919–1921), p. 33. Blacklock, 1926, Ann. Trop. Med. Paras., XX, pp. 11 and 203, Pl. XIX. Connal, 1926, Nigeria Ann. Med. Sanit. Rept. (1925), App. A. Schouteden, 1927, Rev. Zool. Afric., XV, 2, p. [14]. J. Schwetz, 1927, Bull. Soc. Path. Exot. Paris, XX, p. 190.

Edwardsellum damnosum Enderlein, 1921, Zoolog. Anzeiger, LIII, pp. 45 and 46; 1922, Sitzungsber. Ges. Naturf. Fr. Berlin, (1921), p. 80.

Melusina damnosa J. Bequaert, 1913, Rev. Zool. Afric., III, 1, p. 12.

LIBERIA. — Kaka Town, August 18, 1926. Gbanga, September 1926. Moylakwelli, October 27, 1926. Moala, October 31, 1926. Kassata, September 29, 1926. Bakratown, September 30, 1926.

BELGIAN CONGO. — Matadi, December 4, 1926. Leopoldville, December 1926. On the Uele River, between Bambili and Angu (J. Rodhain). Former records from this territory are: Matadi; Lutete; Leopoldville; near Miambwe (Newstead, Dutton and Todd); Uele River (Brumpt; according to this observer the native name of this fly is "furu" on the Uele); and Djamba on the Itimbiri River (Schouteden).

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[1] Robles, R. 1919. 'Onchocercose au Guatemala, produisant la cécité et l' "érysipèle du littoral" ' Bull. Soc. Path. Exot. Paris, XII, pp. 442–463.

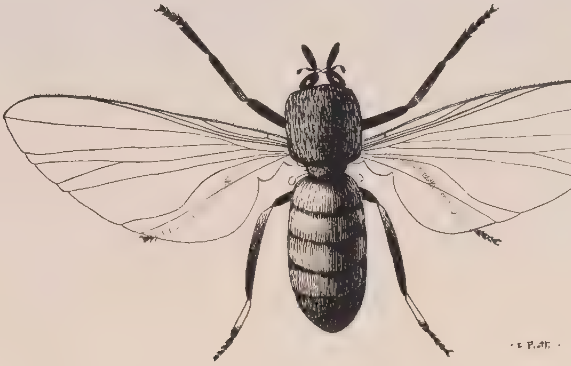
[2] Calderón, V. M. 1920. 'Contribución al estudio del filárido *Onchocerca* sp. Dr. Robles, 1915, y de las enfermedades que produce.' (Guatemala), 107 pp.

[3] Sambon, L. W. 1910. 'Progress report on the investigation of pellagra.' Jl. Trop. Med. Hyg., XIII, pp. 271–282, 287–300, 305–314, 309–321. (*Simulium* theory, pp. 290–291).

Uganda. — Jinja, near the Ripon Falls, April 19, 1927.

If all the published records of *E. damnosum* are based on correct identifications, this species is very widely distributed in tropical Africa, since it is known at present from French Guinea, Sierra Leone, Liberia, Togo, Southern Nigeria, Cameroon, the French Congo, the Belgian Congo, the Anglo-Egyptian Sudan, Uganda, and Tanganyika Territory (Morogoro). In the main, however, its area corresponds in extent with that of the West African Subregion.

At Gbanga, Liberia, *E. damnosum* was very abundant at times in the town, freely biting man at all hours of the day. As has been noted before, it is an extremely bloodthirsty insect and, when it leaves its victim after feeding, a droplet of blood oozes from the bite. It does not appear to enter completely enclosed houses or huts, but it was often seen biting under the cover of the open sheds that serve as rest-houses or meeting-places in the Liberian villages. A number of the flies caught in the town at Gbanga were dissected and microfilariae were found in the gut in one case, while the thoracic muscles of another fly contained larvae similar to those figured by Blacklock as belonging to the life-cycle of *Onchocerca volvulus*. These findings are fully discussed in one of the Medical chapters of this Report (see p. 240). It is of interest that specimens of *E. damnosum* caught along the banks of a stream, away from human habitations, were not found infected with worms.[1]



Text Figure 4. — *Eusimulium damnosum* (Theobald). Female

A careful study of the numerous specimens from the widely separated localities enumerated above discloses no specific differences. It should be noted that some of these specimens were obtained in the type locality of the species. *E. damnosum* is best recognized by the structure of the fore tarsi, which are very broad and swollen, and by the shape and coloration of the hind tarsi: the

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[1] Bequaert, J. 1929. 'The insect carrier of *Onchocerca volvulus* in Liberia.' Fourth Intern. Congr. Entom., Trans., pp. 605–607.

basitarsus is bright white or yellowish white with broad black apex and narrow black base, and is produced apically into a distinct lobe; the following segment is much narrower, with a deep dorsal incision at base and a basal scale-like process, its extreme base dirty yellowish. Some additional characters are as follows: Claws with a sharp tooth near the base. Antennae of eleven segments, black with the first two segments and part of the third reddish yellow. Pleura without a patch of soft hair near the spiracle. First longitudinal vein (radius) ending on the costa beyond the middle of the wing, with fine setulae over its entire length, its stem vein with pale hairs. Third longitudinal vein (radial sector) simple. The best description of the female has been given by Roubaud (1906), while Pomeroy (1920) has described the male and figured the genitalia of that sex.

I am inclined to regard *Edwardsellum cingulatum* Enderlein (1922, Sitzungsber. Ges. Naturf. Fr. Berlin (1921), p. 80; ♀; Khartoum, Anglo-Egyptian Sudan) as not specifically distinct from *E. damnosum.* The only difference which I can discover between my specimens and the description of *E. cingulatum* is in the color of the antennae, which Enderlein describes for his species as follows: "Fühler ockergelb, Geissel mit grauen Reif."

The second Congo species, *Eusimulium dentulosum* (Roubaud), agrees with *E. damnosum* in many of the characters mentioned above. It is, nevertheless, readily distinguished by the shape of the fore tarsi, which are long and slender throughout, by the color of the legs, which are extensively honey-yellow over the femora and tibiae, and by the patch of black pile on the stem vein of the radius.[1]

The peculiarities of the wing place both *E. damnosum* and *E. dentulosum* in the genus *Eusimulium* Roubaud, as defined again by Dyar and Shannon (1927, Proc. U. S. Nat. Mus., LXIX, Art. 10, p. 12). These authors use as a generic character the presence of pilosity over the entire length of the radius in *Eusimulium*, whereas in *Simulium*, proper, the radius is bare between the stem vein and the branching off of the radial sector, which in both genera is simple. I am somewhat doubtful as to the generic value of so slight a difference. In *E. dentulosum* the pilosity of the radius is abundant but short throughout. In *E. damnosum*, however, the basal stretch of this vein (beyond the stem vein) bears only a few short hairs which, although readily seen under the microscope, could hardly be made out with a hand-lens.

In attempting to place these two species in Enderlein's recent classification of the Simuliidae,[2] one finds that *E. dentulosum* would fall in the "tribe Nevermanniini" and most probably in the genus *Friesea* Enderlein (1922). On the other hand, *E. damnosum* should be placed in the "tribe Simuliini," where Enderlein made it the type of a distinct genus, *Edwardsellum* Enderlein (1921), characterized mainly by the sharp tooth close to the base of the tarsal claw and

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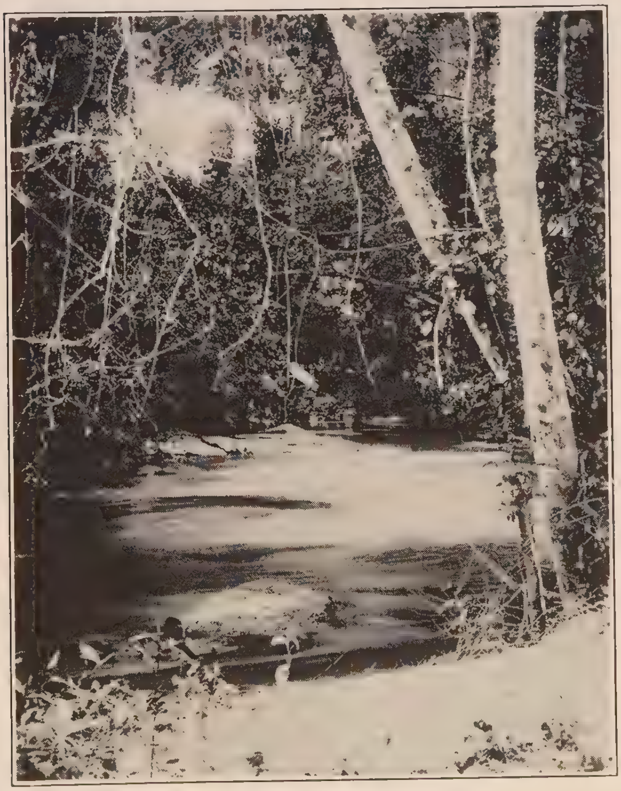
[1] These remarks are based upon a study of five paratypes of *E. dentulosum.*

[2] Enderlein, G. 1921. 'Das System der Kriebelmücken (Simuliidae).' Deutsche Tierärtzl. Wochenschr., XXIX, (April), pp. 197–200.

1921. 'Die systematische Gliederung der Simuliiden.' Zoolog. Anzeiger, LIII, (June), pp. 43–46.

1922. 'Neue Beiträge zur Kenntnis der Simuliiden.' Konowia, I, pp. 67–76.

1925. 'Weitere Beiträge zur Kenntnis der Simuliiden und ihrer Verbreitung.' Zoolog. Anzeiger, LXII, pp. 201–211.

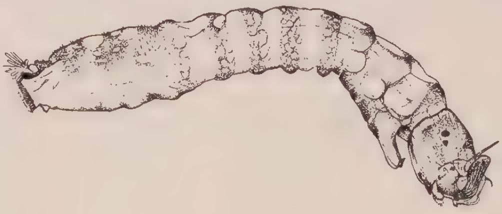


Nos. 475, 476. — Breeding place of *Simulium* sp. at Gbanga, Liberia by the presence of spots of silvery scales on the sides and ventral face of the abdomen.

A discussion of the early stages of *E. damnosum* is given below.

Simulium, species

At Gbanga, Liberia, a careful search was made for the breeding places and early stages of *E. damnosum.* Numerous larvae and pupae of a species of Simuliidae were found in a swiftly running stream of the primary rain forest, about a mile from the town. They were mostly fixed to immersed dead and living leaves, where they were exposed to the full strength of the current. Their habitat is illustrated in Nos. 475 and 476. At the time, these larvae and pupae were believed to be those of *E. damnosum,* although no adult flies were bred from them. This conclusion was based upon the abundance of *E. damnosum* throughout the hinterland of Liberia, where no other adult Simuliidae were seen, and upon the failure to find any other simuliid larvae or pupae in the region of Gbanga. Since, however, my specimens differ conspicuously from what has been described as the early stages of *E. damnosum* by H. H. King and Pomeroy, their identity remains doubtful, so that it will be necessary to describe them in detail.

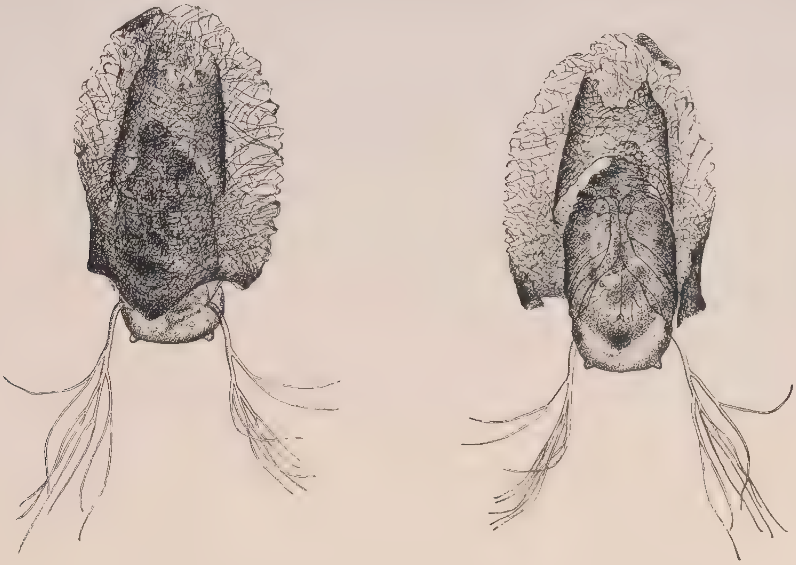


Text Figure 5. — Larva of *Simulium*, species, at Gbanga, Liberia

Last stage larva. (Text Fig. No. 5). — Average length, 3.5 to 4 mm. Antennae long and slender, entirely membranous, of four segments, the first slightly more swollen than the second, the fourth minute; in shape they are almost exactly as figured by Puri (1925, Parasitology, XVII, p. 355, fig. 17*B*) for *Simulium aureum* Fries. Cephalic fan filaments few, about 30. Mandibles agreeing best with those of *S. reptans* (Linnaeus), as figured by Puri (*loc. cit.*, p. 341, fig. 9*C*): proximal to the three strongly chitinized black teeth of the apex there are along the inner margin three smaller teeth, followed by a row of 8 to 10 bristle-like teeth, behind which are placed 4 to 6 smaller teeth; the two preapical tooth-like processes of the inner margin are long and slender and placed far apart. Submentum almost exactly as figured by Puri for *S. ornatum* Meigen (*loc. cit.*, p. 338, fig. 7*D*), which seems to be the usual type: the front row with 9 teeth, of which the median and the one at each end are much enlarged; a pair of smaller teeth external to the large teeth of the sides. Abdomen ending in two small papillae; the posterior "sucker" with 50 to 60 rows of hooks. Three anal gills, each ramified into 8 long, retractile branches. In addition to the usual short hairs scattered over the body, the dorsal part of the last three segments of the abdomen bears a number of peculiar, rod-like setae.

Pupa (Text Fig. No. 6). — Average length, 1.5 to 2 mm. It is enclosed in a tough and closely woven cocoon, of a peculiar shape best described as a double wall-pocket: the outer pocket covers the pupa more or less completely and its upper margin is considerably produced in the middle into a broadly triangular lobe; to the inner side of this outer pocket is attached a much narrower and incomplete piece which corresponds to the floor of the cocoon of some other species. Respiratory filaments about as long as the pupa, each consisting of a long main stalk divided into eight slender branches; the branches are united in four pairs, the two inner pairs being borne on a common stalk. Among the African species of which Pomeroy has described the pupae, *S. alcocki* var. *coalitum* Pomeroy (1922, Bull. Ent. Res., XII, 4, p. 460, Pl. XVI, fig. 1), of Ibadan, Nigeria, has somewhat similar respiratory filaments, although the number of branches is larger (10). It is rather remarkable that Pomeroy regarded the long-stalked filaments of this form as perhaps the result of malformation. This is certainly not the case for the Liberian species here described, as I have examined many specimens and found them all alike.

In 1907, Roubaud described the early stages of an African black-fly which he referred to *E. damnosum*, although he bred no adults from the pupae. He found both larvae and pupae near Brazzaville, French Congo, attached to aquatic plants in torrents running to the Stanley Pool. The larvae were provided with three rectal pennate gills, which could be expanded or retracted at will. Such retractile gills Roubaud regarded as an adaptation to aquatic life in the very hot regions of Central Africa. The pupae he described as sheltered within a cocoon of the usual trumpet shape; the eight respiratory filaments start from three main stalks, of which the outer and inner ones are bifurcate once, while the middle one is bifurcate twice and at different levels. Although the descriptions are very brief, I am inclined to believe that Roubaud dealt with larvae and pupae identical with, or at least very similar to, those I here describe from Liberia.



Text Figure 6. — Dorsal and ventral aspects of pupa and cocoon of *Simulium*, species, at Gbanga, Liberia

H. H. King (1909) described and figured larvae and pupae from Abu Hamed, Anglo-Egyptian Sudan, which he claimed to be those of *E. damnosum*, although he evidently bred no adult flies from them. The short description of the larva mentions no characters of specific value and only the general appearance can be gathered from the figure.[1] The pupa, he says, "is pale chestnut brown in colour and is enclosed in a semi-transparent, brown, pocket-shaped cocoon, about 3 mm. in length. Projecting above the edge of the cocoon is a pair of white to greyish white respiratory appendages. Each appendage consists of three leaf-like processes, two of which are united at the base." This brief account and the rather crude figure are sufficient to conclude that this supposed pupa of *E. damnosum* is totally different from the one I have described above from Liberia.

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[1] "The larva resembles in shape and general appearance the *Nimitti* larva [*Simulium griseicollis* Becker], but can be distinguished from it by its relatively larger size and darker colour. A dark pigmented patch is usually present on either side of the first thoracic segment. Length about 6 mm." The description of the larva of *S. griseicollis* also is couched in very general terms, mentioning hardly anything beyond peculiarities common to nearly all simuliid larvae.

Pomeroy (1920) has given a much more complete description of a pupa supposedly of *E. damnosum*, from specimens collected in Morogoro, Tanganyika Territory. He states that some of the pupae contained male imagos which were dissected out and compared with emerged adults, bred from the same locality and at the same time. Also some females bred from the same lot of pupae were compared with the type of *E. damnosum* at the British Museum. His description is as follows: "The filaments are rather pale and translucent in structure. They are composed of eight main lobes, bulbous and finger-like. The cephalic and caudal lobes very broad in the middle, pointed toward the apex. These two lobes are very often found split up the centre. The remaining six arise from the base of the main stem in pairs, and in some specimens a short broad secondary finger-like filament is present attached to one of the middle filaments, usually the first cephalic pair, about halfway up." These statements as well as Pomeroy's figure cannot possibly be applied to my Liberian pupae nor to those described by Roubaud. They seem to fit much better the pupae studied by King.

It will remain for future investigators to decide which are the true early stages of *Eusimulium damnosum*.[1]

TABANIDAE

The present study of African Tabanidae is not merely an enumeration of the species collected during the Harvard African Expedition. As I have had an opportunity to examine much material of this family from the Belgian Congo,[2] I have included a synopsis of the species known from that territory, with keys to enable their identification. I have added some critical remarks on the classification, on the limits of the genera and subgenera, as well as a key to the genera found in the Ethiopian Region (including the Malagasy Subregion).

In attempting to name tabanids with the subjoined keys, only fairly well preserved specimens should be used, preferably such as have been pinned in the field. The relaxing jar will often spoil these flies beyond recognition and they can but seldom be correctly identified after having been preserved in a fluid.

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[1] The caption "*Simulium damnosum*" in Faust's 'Human helminthology' (1929, p. 551, fig. 271) is evidently due to an oversight. The figure is a copy of a drawing by Sikora in Martini's 'Lehrbuch der medizinischen Entomologie' (1925, p. 186, fig. 120), which, however, is merely labelled "*Simulium.*" Most probably the drawing represents the early stages of some European species.

[2] I wish to thank my friend, Dr. H. Schouteden, Director of the Congo Museum at Tervueren, Belgium, for kindly communicating to me much valuable material. I have also been able to study the tabanids obtained in the Belgian Congo by the Lang and Chapin Expedition of the American Museum of Natural History, as well as some African specimens of the United States National Museum and the Museum of Comparative Zoölogy of Harvard University.

THE TABANID FAUNA OF LIBERIA[1]

Few previous Liberian records of tabanids are to be found in the literature. I was informed by one of the Liberian officials that Sir Alfred Sharpe collected biting insects during his journey through the hinterland of Liberia, a few years ago; but no account of his captures appears to have been published thus far. The following list is therefore based almost entirely upon observations made by the members of the Harvard Expedition. It is probably a mere fragment of the fauna, since many more species are known from the adjoining colonies of Sierra Leone and the Ivory Coast. Owing to the scarcity or absence of big game, cattle and horses, horse-flies are much more difficult to observe in the dense rain forest than in the open savanna. Moreover, even this incomplete list sufficiently indicates the character of the tabanid fauna of Liberia, which is not different from that of the neighboring parts of West Africa.

* *Chrysops longicornis* Macquart.
* *Tabanus besti* Surcouf.
* “ “ var. *arbucklei* Austen.
* “ *fasciatus* Fabricius.
* “ *kingsleyi* Ricardo.
* “ *marmorosus* Surcouf.
* “ *obscurehirtus* Ricardo.
* *Tabanus pluto* Walker.
* “ *ruficrus* Palisot de Beauvois.
* “ *secedens* Walker.
* “ *socialis* Walker.
* “ *taeniola* Palisot de Beauvois.
* “ *tenuipalpis* Austen.
* *Haematopota guineensis* Bigot.

THE TABANID FAUNA OF THE ISLANDS OF THE GULF OF GUINEA

The discovery of an apparently undescribed species of *Tabanus* in Prince's Island (Principe) led me to investigate the tabanids at present known from that island and its neighbors. Very few species have thus far been recorded from those islands, the following short list containing all the records that I have been able to find in the literature. It is quite possible that some of them are based on erroneous identifications. No tabanid appears to have been reported from Annobon.

Chrysops silacea Austen (Fernando Po).
Tabanus biguttatus var. *croceus* Surcouf (S. Thomé).
“ *congoiensis* Ricardo (S. Thomé; Prince's I.).
“ *obscurefumatus* Surcouf (S. Thomé).
* “ *principis* J. Bequaert (Prince's I.).
“ *sagittarius* Macquart (S. Thomé; Rolas I.).
“ *socialis* Walker (Fernando Po).
“ *taeniola* Palisot de Beauvois (Prince's I.).
“ *williamsii* Austen (Fernando Po).

THE TABANID FAUNA OF THE BELGIAN CONGO[2]

Ecological conditions are extremely varied in the vast territory covered by the Belgian Congo, so that one might expect a corresponding variety in the fauna. Of still greater importance is the fact that this territory comprises areas belonging to two fundamentally distinct zoögeographic subregions of the Ethiopian Region. By far the greater part of the Belgian Congo belongs to the West African Subregion, its fauna being similar to that of Upper and Lower Guinea. The southeastern corner (in what may be called Upper Katanga) and the highlands along the eastern border, however, are included in the East-and-South African Subregion, their fauna being essentially that of the neighboring territories of East Africa.[1]

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[1] In this and the following lists, an asterisk precedes the species and varieties which are recorded from actual specimens seen and identified by the author.

[2] A popular account of the horse-flies of the Congo has been published recently by Vanderyst, H. 1928. 'Les Tabanidés hémophages au Congo belge.' Bull. Agric. Congo Belge, XIX, pp. 607–630.

Of the one hundred and thirty-four species and varieties of the subjoined list, few are generally or very widely distributed throughout the Ethiopian Region. Such omnipresent forms are *Chrysops longicornis* Macquart, *Tabanus africanus* Gray, *T. par* Walker, *T. thoracinus* Palisot de Beauvois, *T. biguttatus* Wiedemann, *T. xanthomelas* Austen, *T. atrimanus* Loew, *T. variabilis* Loew, *T. gratus* Loew, *T. laverani* Surcouf, *T. fraternus* Macquart, *T. sagittarius* Macquart, *T. taeniola* Palisot de Beauvois, *Haematopota pertinens* Austen, *H. decora* Walker, and *H. vittata* Loew.

The following species may be regarded as typical of the West African Subregion: *Dasycompsa cincta* Enderlein, *Hineà rodhaini* (J. Bequaert), *Tabanocella stimulans* (Austen), *Thriambeutes singularis* Grünberg, *Subpangonia gravoti* Surcouf, *Nuceria mayombensis* J. Bequaert, *Chrysops dimidiata* van der Wulp, *C. funebris* Austen, *C. silacea* Austen, *C. distinctipennis* Austen, *Tabanus argenteus* Surcouf, *T. besti* Surcouf, *T. billingtoni* Newstead, *T. canus* Karsch, *T. claripes* Ricardo, *T. congoiensis* Ricardo, *T. fasciatus* Fabricius, *T. fuscomarginatus* Ricardo, *T. ianthinus* Surcouf, *T. irroratus* Surcouf, *T. marmorosus* Surcouf, *T. obscurefumatus* Surcouf, *T. obscurehirtus* Ricardo, *T. obscurior* Ricardo, *T. regnaulti* Surcouf, *T. ruficrus* Palisot de Beauvois, *T. secedens* Walker, *T. socialis* Walker, *Thaumastocera akwa* Grünberg, *Haematopota angustifrons* Carter, *H. duttoni* Newstead, *H. harpax* Austen, *H. inornata* Austen, *H. ochracea* (Bezzi), *Hippocentrum strigipenne* (Karsch), and *H. versicolor* Austen. While most of these species extend eastward into Uganda or even into the Nyanza Province of Kenya Colony (the fauna of that Province being typically West African), some do not reach westward beyond the Cameroon. In the Katanga District a number of West African species extend southward beyond the limits of the West African Subregion along the valleys of certain rivers, their distribution following that of the tsetse-fly, *Glossina palpalis*. A few species, such as *Chrysops brucei* Austen, seem to be more or less restricted to the Uganda-Unyoro District.

The East-and-South African elements are found only in Upper Katanga and the mountains of the eastern borderland. They comprise: *Mesomyia fallax* (Austen), *Tabanocella innotata* (Karsch), *T. umbraticola* (Austen), *Philoliche oldii* (Austen), *Dorcaloemus auricomus* Austen, *D. compactus* (Austen), *Nuceria schwetzi* (Austen), *Chrysops laniger* Loew, *C. stigmaticalis* Loew, *Taba-*

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[1] The boundary between the West African and East-and-South African Subregions may be seen on the map of the zoögeographic regions of the Belgian Congo published by H. A. Pilsbry and J. Bequaert in 1927 (Bull. Amer. Mus. Nat. Hist., LIII, p. 487). The same publication contains a summary of the topography, climate, vegetation and other ecological conditions of the territory here under discussion.

nus coniformis Ricardo, *T. diversus* Ricardo, *T. maculatissimus* Macquart, *T. medionotatus* Austen, *T. nyasae* Ricardo, *T. obscuripes* Ricardo, *T. sharpei* Austen, *T. variabilis* Loew, *Haematopota brunnescens* Ricardo, *H. copemanii* Austen, *H. hirsutitarsus* Austen, *H. insatiabilis* Austen, *H. masseyi* Austen, *H. sanguinaria* Austen, and *H. stimulans* Austen. In addition several species are known only from Upper Katanga, but most of these will probably be found in Rhodesia also: *Hinea dubiosa* Mich. Bequaert, *Philoliche infusca* (Austen), *Dorcaloemus candidolimbatus* Austen, *Ommatiosteres bukamensis* (J. Bequaert), *Nuceria inornata* (Austen), *N. neavei* (Austen), *N. virgata* (Austen), *Chrysops neavei* Austen, *Tabanus brodeni* J. Bequaert, *T. gedoelsti* Surcouf, *T. lufirensis* J. Bequaert, *T. muluba* J. Bequaert, and *Haematopota cruenta* Austen. Very few tabanids are found in the higher mountains of the eastern Congo and only two of them appear to be typical of the montane region proper, *viz.*, *Tabanus ruwenzorii* Ricardo, of Ruwenzori, and *Haematopota hirta* Ricardo, of the Virunga volcanoes.

The most interesting cases of distribution are those in which species that are common in the savannas of the East-and-South African Subregion are replaced in the rain forest of the West African Subregion by closely allied forms, so-called vicarious or substitute species. The following are a few examples of such pairs, the East African form preceding the West African in each case: *Dasycompsa apiformis* (Neave) and *D. cincta* Enderlein; *Chrysops stigmaticalis* Loew and *C. distinctipennis* Austen; *Tabanus maculatissimus* Macquart and *T. irroratus* Surcouf; *Haematopota vittata* Loew and *H. ochracea* (Bezzi). When the relationships between the species are better understood, many other cases of this kind will be discovered. It is obvious that the members of such pairs are genetically related, having been evolved either from each other or from some common ancestor.

* *Mesomyia fallax* (Austen).
* *Dasycompsa cincta* Enderlein.
Hinea dubiosa Mich. Bequaert.
* “ *rodhaini* (J. Bequaert).
* *Tabanocella innotata* (Karsch).
“ *perpulcra* (Austen).
* “ *stimulans* (Austen).
* “ *umbraticola* (Austen).
* *Thriambeutes austeni* (Hine).
* “ *singularis* Grünberg.
* *Subpangonia gravoti* Surcouf.
* *Philoliche infusca* (Austen).
* “ *oldii* (Austen).
* *Stenophara rodhaini* (J. Bequaert).
Dorcaloemus auricomus Austen.
* “ *candidolimbatus* Austen.
* “ *compactus* (Austen).
* *Ommatiosteres bukamensis* (J. Bequaert).
* *Nuceria inornata* (Austen).
* “ *mayombensis* J. Bequaert.
* “ *neavei* (Austen).
* “ *schwetzi* (Austen).
* “ *virgata* (Austen).
* *Chrysops brucei* Austen.
* “ *dimidiata* van der Wulp.
* “ *distinctipennis* Austen.
* “ *funebris* Austen.
* “ *griseicollis* J. Bequaert.
* “ *langi* J. Bequaert.
* “ *laniger* Loew.
* “ *longicornis* Macquart.
* “ *neavei* Austen.
* “ *silacea* Austen.
* “ *stigmaticalis* Loew.
* *Tabanus africanus* G. R. Gray.
* “ *argenteus* Surcouf.
* “ *atrimanus* Loew.
* “ *besti* Surcouf.
* “ *biguttatus* Wiedemann.
* “ “ var. *croceus* Surcouf.
“ “ var. *unimaculatus* Macquart.
* “ *billingtoni* Newstead.
* “ *boueti* Surcouf.
* “ *brodeni* J. Bequaert.
* “ *brucei* Ricardo.

* *Tabanus canus* Karsch.
* “ *claripes* Ricardo.
* “ *congoiensis* Ricardo.
* “ *coniformis* Ricardo.
* “ *denshamii* Austen.
“ *distinctus* Ricardo.
* “ *ditoeniatus* Macquart var. *bipunctatus* van der Wulp.
“ *diversus* Ricardo.
* “ *fasciatus* Fabricius.
“ “ var. *atripes* van der Wulp.
“ “ var. *mixtus* Surcouf.
* “ “ var. *nigripes* Surcouf.
* “ *fraternus* Macquart.
“ *fulvicapillus* Carter.
* “ *fuscomarginatus* Ricardo.
* “ *gedoelsti* Surcouf.
* “ *gratus* Loew.
* “ *ianthinus* Surcouf.
* “ *irroratus* Surcouf.
* “ *laverani* Surcouf.
* “ *lufirensis* J. Bequaert.
* “ *maculatissimus* Macquart.
* “ *marmorosus* Surcouf var. *congoicola* J. Bequaert.
* “ *medionotatus* Austen.
* “ *muluba* J. Bequaert.
* “ *niveinotatus* J. Bequaert.
* “ *nyasae* Ricardo.
* “ *obscurefumatus* Surcouf.
* “ *obscurehirtus* Ricardo.
* “ “ var. *lubutuensis* J. Bequaert.
“ *obscurestriatus* Ricardo.
* “ *obscurior* Ricardo.
* “ *obscuripes* Ricardo.
* “ *par* Walker.
* “ *quadrisignatus* Ricardo.
* “ *regnaulti* Surcouf.
* “ *ruficrus* Palisot de Beauvois.
* “ *ruwenzorii* Ricardo.
* “ *sagittarius* Macquart.
* “ *secedens* Walker.
“ *severini* Surcouf.
* “ *sharpei* Austen.
* “ *socialis* Walker.
* *Tabanus socius* Walker.
“ *sufis* Jaennicke.
* “ *taeniola* Palisot de Beauvois.
* “ *thoracinus* Palisot de Beauvois.
* “ *ustus* Walker var. *disjunctus* Ricardo.
* “ *variabilis* Loew.
* “ *wellmanii* Austen.
* “ *xanthomelas* Austen.
* *Thaumastocera akwa* Grünberg.
* *Haematopota angustifrons* Carter.
* “ *brunnescens* Ricardo.
“ *brunnipennis* Ricardo.
* “ *ciliatipes* J. Bequaert.
* “ *copemanii* Austen.
“ *cruenta* Austen.
* “ *decora* Walker.
* “ *denshamii* Austen.
* “ *divisapex* Austen.
* “ *duttoni* Newstead.
* “ *furva* Austen.
* “ *harpax* Austen.
* “ *hirsutitarsus* Austen.
* “ *hirta* Ricardo.
* “ *inornata* Austen.
* “ *insatiabilis* Austen.
“ *laverani* Surcouf.
* “ *mactans* Austen.
* “ *masseyi* Austen.
* “ *neavei* Austen.
* “ *nigripennis* Austen.
* “ *ochracea* (Bezzi).
* “ *partifascia* J. Bequaert.
“ *pellucida* (Surcouf).
* “ *pertinens* Austen.
* “ *perturbans* Edwards.
* “ *sanguinaria* Austen.
* “ *schoutedeni* (Surcouf).
* “ *similis* Ricardo.
* “ *stimulans* Austen.
* “ *tabanula* J. Bequaert.
* “ *torquens* Austen.
* “ *tumidicornis* Austen.
* “ *vexans* Austen.
* “ *vittata* Loew.
* *Hippocentrum strigipenne* (Karsch).
* “ *versicolor* Austen.

ON THE NATURAL GROUPING OF THE TABANIDAE

The prevailing opinion among the specialists of the group seems to be that Enderlein's recent classification of the Tabanidae into nine subfamilies and over one hundred and fifty genera does not express true relationships.[1] In view of the failure of this pretentious scheme of classification, any future attempt at a natural grouping of the horse-flies will probably be met with scepticism. Nevertheless, I venture to present a tentative grouping embodying my views of the natural relationships between the several genera.

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[1] I have given a concise account of Enderlein's views in 1924, Psyche, XXXI, pp. 36–40.

I recognize among the Tabanidae three main divisions, which I shall rank as subfamilies, although I am fully aware that one of them (Coenomyiinae) is farther removed from the rest of the family than the two other subfamilies are from each other. The proper solution of this difficulty might be to raise the Coenomyiinae to family rank; but this course would obscure the significance of this particular group as a connecting link between the remaining Tabanidae and the Leptidae.

1. Subfamily COENOMYIINAE. — Eyes broadly separated by the frons in the female, contiguous (holoptic) in the male. Ocelli present. Proboscis short, well-developed; palpi normal. Third antennal segment composed of eight divisions. Hind tibiae with two spurs. Wings with the anal and all posterior cells broadly open; sixth longitudinal vein (*An*) strongly wavy; squamae present, though smaller than in most other tabanids. This subfamily comprises *Coenomyia* Latreille, *Pelecorhynchus* Macquart, and *Coenura* Bigot, none of which are represented in Africa.

These three genera form the transition between the Tabanidae and the subfamily Xylophaginae among the Leptidae. The next steps in the passage are provided by *Arthropeas* Loew and *Glutops* Burgess. Whether any of the other genera included by Kertész (1908, 'Cat. Dipt.,' III, pp. 141–146) in his family Coenomyiidae, are related to *Coenomyia* I am unable to state.[1] Although I cannot enter into a further discussion of this group, I may point out that Bigot and Philippi placed *Coenura* in the Coenomyiidae (which Bigot regarded as a division of his Tabanidi); Schiner regarded it as allied to *Arthropeas* and Osten Sacken placed it in the Xylophagidae. On the other hand, Gerstaecker and Brauer were positive that it was one of the Pangoniinae.

2. Subfamily PANGONIINAE. — Eyes more or less broadly separated by the frons in the female, separated or contiguous in the male. Ocelli either present or absent. Proboscis of variable length, often longer than the head, in some cases aborted. Hind tibiae with two spurs, which sometimes are very small. Wings with the sixth longitudinal vein (*An*) straight.

The numerous genera of this subfamily appear to form three fairly natural groups which I shall call tribes.

2*a*. Tribe PANGONIINI. — Eyes hairy or bare, not spotted or streaked in life. Ocelli present or absent. Proboscis and palpi well-developed, the former of variable length. Antennae short, the second segment at most half as long as the first. This tribe contains most of the genera of Pangoniinae.

2*b*. Tribe CHRYSOPINI. — Eyes bare, in life with spots or zigzag streaks. Ocelli present. Frons of female at least as wide as long, often wider. Proboscis and palpi well-developed, the former at most slightly longer than the head. Antennae elongate; the first segment slender or swollen; the second always over half the length of the first, often equally long, rarely longer; the third composed of five main divisions, but the basal division frequently more or less subdivided, sometimes quite deeply so. This tribe apparently comprises but one genus, *Chrysops* Meigen. All the several names proposed for divisions of *Chrysops* are at most of subgeneric value. Even *Nemorius* Rondani does not seem to be a valid genus.

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[1] I have recently learned in correspondence that Dr. J. M. Mackerras, of Sydney, has independently reached the conclusion that *Pelecorhynchus* belongs in a distinct subfamily from the remainder of the Tabanidae.

2*c*. Tribe SCEPSIDINI. — Eyes bare, in life without spots or streaks. Ocelli present. Proboscis and palpi vestigial or aborted. Antennae short, the second segment at most half as long as the first. This tribe comprises *Scepsis* Walker, *Adersia* Austen, *Braunsiomyia* J. Bequaert (= *Brodenia* Surcouf), and *Lesneus* Surcouf. The three last-named genera are African. *Scepsis* is supposedly South American, but the single species, *S. nivalis* Walker, is known only from the poorly preserved type specimen.[1]

3. Subfamily TABANINAE. — Eyes more or less broadly separated by the frons in the female, contiguous (holoptic) in the male. Ocelli generally absent, sometimes vestigial, rarely well-developed. Proboscis at most as long as the head. Hind tibiae without spurs. Wings with the sixth longitudinal vein (*An*) straight.

This subfamily consists of two natural divisions, or tribes:

3*a*. Tribe TABANINI. — Eyes bare, pubescent, or hairy, uniformly colored or with cross-bands, very rarely with numerous rounded spots or with zigzag markings. Frons of female elongate, longer than wide. Third antennal segment almost always composed of five divisions, the basal division as a rule more or less expanded, often toothed or angulate at the base (in *Thaumastocera* the third segment consists of three or four divisions, but the basal division bears a long tooth). This tribe comprises most of the genera of the Tabaninae, but is only represented in Africa by *Tabanus* Linnaeus and *Thaumastocera* Grünberg.

3*b*. Tribe HAEMATOPOTINI. — Eyes bare, very rarely pubescent, in life usually with peculiar zigzag markings. Frons of female wide, often about as wide as long or wider, with two or three velvety spots; the basal callosity transverse. Third antennal segment as a rule composed of four divisions, rarely of three or five, the basal division never crescent-shaped or toothed. This tribe comprises only three genera: *Haematopota* Meigen, *Hippocentrum* Austen, and *Heptatoma* Meigen, the former two being found in Africa.

Two other genera are placed by Enderlein in his "subfamily" Haematopotinae (characterized by the third antennal segment of four divisions, rarely of three), *viz.*, *Dasybasis* Macquart and *Baikalia* Surcouf.[2] Macquart's genus was erected for an Australian species and Enderlein evidently has followed the original description and figures. Australian students of Tabanidae are of the opinion that *Dasybasis* owed its origin to a mistake in counting the divisions of the third antennal segment, and should be sunk under *Tabanus* (see Ferguson and Hill, 1920, Proc. Linn. Soc. New South Wales, XLV, p. 466). *Baikalia* appears to be closely allied to *Tabanus*, since the female has a narrow frons (about four times as long as wide) and pubescent eyes with a cross-streak.

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[1] Miss Ricardo (1901, Ann. Mag. Nat. Hist., (7) VIII, p. 286) says that the type of *S. nivalis* is a female, without antennae. Surcouf states that it is a male. I believe that Miss Ricardo was correct.

[2] This name being preoccupied by *Baicalia* v. Martens, 1876, I have changed it to *Surcoufiella* J. Bequaert (1924, Psyche, XXXI, p. 26).

These subfamilies and tribes comprise in the Ethiopian Region the following genera and subgenera, the synonyms being added in parenthesis.

SUBFAMILY PANGONIINAE

Tribe Pangoniini

Silvius Meigen (*Perisilvius* Enderlein).
Mesomyia Macquart (*Dasysilvius* Enderlein).
Dasycompsa Enderlein.
Pronopes Loew.
Hinea C. F. Adams.
Tabanocella Bigot.
Thriambeutes Grünberg.
Orgizomyia Grünberg (*Methoria* Surcouf).
Guyona Surcouf.
Triclida Enderlein (*Stypotriclida* Enderlein; *Triclidomissa* Enderlein).
Bouvieromyia Strand (*Bouvierella* Surcouf).
Aegophagamyia Austen.
Rhigioglossa Wiedemann (*Erodiorhynchus* Macquart; *Scarphia* Walker; *Metoponaplos* Ricardo).
Phara Walker (*Cadicera* Macquart).
Subpangonia Surcouf.
Metaphara Enderlein.
Philoliche Wiedemann (*Nuceria* Enderlein).
Stenophara Enderlein.
Dorcaloemus Austen.
Scaptia Walker (*Osca* Walker; *Diatomineura* Rondani; *Pseudoscaptia* Enderlein).
Buplex Austen.
Ommatiosteres Enderlein.
Nuceria Walker (*Corizoneura* Rondani; *Siridorhina* Enderlein).

Tribe Chrysopini

Chrysops Meigen.

1. Subgenus *Chrysops*, proper (*Chrysopsis* Duméril; *Heterochrysops* Kröber; *Ziemannia* Enderlein).
2. Subgenus *Klaineana* Enderlein (*Neochrysops* Szilády; *Psylochrysops* Szilády).

Tribe Scepsidini

Adersia Austen.
Braunsiomyia J. Bequaert (*Brodenia* Surcouf).
Lesneus Surcouf.

SUBFAMILY TABANINAE

Tribe Tabanini

Tabanus Linnaeus.

1. Subgenus *Tabanus*, proper (*Straba* Enderlein).
2. Subgenus *Therioplectes* Zeller (*Sziladya* Enderlein; *Brachytomus* Costa).
3. Subgenus *Sziladynus* Enderlein.
4. Subgenus *Atylotus* Osten Sacken (*Ochrops* Szilády; *Dasystypia* Enderlein).
5. Subgenus *Atelozella* J. Bequaert (*Ateloza* Enderlein).
6. Subgenus *Ancala* Enderlein.
7. Subgenus *Euancala* Enderlein.

Thaumastocera Grünberg (*Hybommia* Enderlein).

Tribe Haematopotini

Haematopota Meigen (*Chrysozona* Meigen).
Hippocentrum Austen.

Although I have been unable to recognize many of Enderlein's recently proposed generic names, I have made what I believe an honest attempt to retain those that seemed to cover fairly natural groups. When the characters separating complexes of apparently related species are altogether too trifling, I have preferred to use some of Enderlein's names in a subgeneric sense. Moreover, I feel that I have erred rather on the conservative side and that future work will reduce rather than increase the number of genera here accepted for the Ethiopian Tabanidae.

Key to Ethiopian Genera of Tabanidae

1. Hind tibiae without spurs. Proboscis well-developed, at most as long as the head, usually shorter. Ocelli usually absent, very rarely vestigial or present............ 2.

Hind tibiae with two spurs, which are sometimes very small........................ 5.

2. Third antennal segment composed of three or four divisions; the basal portion bearing on the upper side a long, finger-shaped process at the base and, in the female, a second short tooth or protuberance in the middle. Ocelli present. Eyes bare. Frons elongate in the female. Fork of third longitudinal vein without appendix. .... *Thaumastocera.*

Third antennal segment plain or toothed at base, but without a long, finger-shaped process. Ocelli absent or vestigial in the African species........................ 3.

3. Third antennal segment composed of five divisions, the basal division more or less crescent-shaped. Eyes bare, pubescent or hairy, either uniformly colored or with straight or curved cross-bands, rarely with numerous rounded spots. Frons elongate, almost always much longer than wide.................................. *Tabanus.*

Third antennal segment composed of three or (more generally) four divisions; the basal division more or less cylindrical or disciform, not crescent-shaped. Frons very wide, often as wide as long. Eyes bare, generally with zigzag stripes in life...... 4.

4. Head wholly or mostly shiny. Antennae very slender; the first segment elongate, at least six times as long as the second. Terminal segment of palpi usually swollen and more or less shiny on the outer side. Wings with a short or no appendix on the fork of the third longitudinal vein, entirely dark or with pale streaks or blotches. .... *Hippocentrum.*

Head mostly covered with a dull bloom, setting off shiny calli or velvety spots. Antennae less slender; the first segment shorter and more swollen, usually less than six times as long as the second. Terminal segment of palpi not considerably swollen nor shiny. Wings more or less infuscated, as a rule with numerous pale blotches arranged into "rosettes" or groups, more rarely forming hyaline streaks; the fork of the third longitudinal vein in the majority of cases with a long appendix. *Haematopota.*

5. Proboscis vestigial or aborted. Palpi minute. Ocelli present. Eyes bare............. 6.

Proboscis well-developed, usually longer than the head, often considerably so. Palpi large. Ocelli present or absent.. 8.

6. Fourth posterior cell closed; the second, third and fourth posterior cells separated by longitudinal veins which reach the hind margin. (Male unknown).......... *Lesneus.*

Fourth posterior cell open.. 7.

7. Third antennal segment composed of eight divisions (the style, of four divisions). Eyes separated in both sexes; frons very broad in the female, with a large, transverse callosity; considerably narrowed, but still distinct in the male......... *Adersia.*

Third antennal segment composed of seven divisions (the style, of four divisions). Frons very broad in the female, but without callosity; in the male the eyes are holoptic.. *Braunsiomyia.*

8. First and second antennal segments both elongate or swollen; the second distinctly more than half the length of the first, often equally long or even longer; the third segment composed of five main divisions. Frons broad in the female, often wider than long. Ocelli present. Eyes bare, in life with zigzag spots or streaks.............. *Chrysops.*

First and second antennal segments short; the second as a rule not more than half the length of the first.............. 9.

9. Third antennal segment composed of five divisions, the basal division with a long, finger-shaped process. Ocelli present. Eyes bare. First and fourth posterior cells open... 10.

Basal division of the third antennal segment without finger-shaped process, at most angulate or crescent-shaped.............. 11.

10. Terminal segment of palpi swollen, crescent-shaped. Subcallus (bearing the antennae) very prominent. Abdomen flattened, narrowed posteriorly, the apical segments forming a short ovipositor.............. *Hinea.*

Terminal segment of palpi very elongate, slender. Subcallus (bearing the antennae) not particularly prominent. Abdomen of the usual shape.............. *Tabanocella.*

11. The four terminal divisions of the slender portion of the third antennal segment more or less fused (so that the segment consists of only two distinct divisions). Ocelli present. Eyes bare. First and fourth posterior cells, as a rule, open (the first rarely closed before the margin?).............. *Rhigioglossa.*

The divisions of the slender, apical portion (or style) of the third antennal segment distinct, four to seven in number.............. 12.

12. Third antennal segment composed of four or five divisions. Proboscis usually shorter than the head, rarely of the same length or slightly longer.............. 13.

Third antennal segment composed of seven or eight divisions. Proboscis long or short, often much longer than the head.............. 23.

13. Antennae placed upon a prominent subcallus; face also swollen beneath the antennae. First and fourth posterior cells open.............. 14.

Subcallus bearing the antennae not unusually prominent.............. 16.

14. Palpi long and slender. Basal division of third antennal segment strongly flattened, very broadly oval, only a little longer than wide, with a bluntly projecting edge about the middle of the upper margin and a sharper projection at the apex. *Orgizomyia.*

Palpi considerably swollen, stout.............. 15.

15. Basal division of third antennal segment flattened, with a tooth-like projection on the upper margin.............. *Guyona.*

Basal division of third antennal segment elongate oval, without tooth or projecting edge on the upper margin.............. *Thriambeutes.*

16. Ocelli absent. First posterior cell closed before the margin; the third open. Proboscis longer than the head. Palpi very short, pointed and slender.............. *Metaphara.*

Ocelli present.............. 17.

17. First and fourth posterior cells both closed and stalked before the margin. Eyes bare... 18.

First and fourth posterior cells open; rarely closed just at the margin.............. 20.

18. First posterior cell short-petiolate, the stalk at most slightly longer than that of the fourth posterior cell. Proboscis short, with large labella. A narrow frontal callus present in the female.............. 19.

First posterior cell long-petiolate, the stalk two to three times as long as that of the fourth posterior cell. Proboscis slender and elongate, with narrow, elongate labella. Frontal callus absent in the female. Basal division of third antennal segment with even upper margin.............. *Aegophagamyia.*

19. Basal division of third antennal segment with a projecting blunt edge on the upper margin.............. *Bouvieromyia.*

Basal division of third antennal segment with even upper margin.............. *Triclida.*

20. Frons very wide and parallel-sided in both sexes, much broader than long in the female. Eyes pubescent. Palpi short.............. *Pronopes.*

Frons in the female longer than broad or at most as wide as long; linear or absent in the male. Eyes bare or pubescent.............. 21.

21. Third antennal segment composed of four distinct divisions only. Eyes pubescent. Frons in the female without basal callus.............. *Dasycompsa.*

Third antennal segment composed of five distinct divisions.............. 22.

22. Eyes bare in both sexes. Third antennal segment not crescent-shaped. Frons in the female as a rule with a distinct basal callus.................................. *Silvius.*
Eyes pubescent in both sexes (often slightly so in the female). Third antennal segment more or less crescent-shaped. Frons in the female with or without distinct basal callus.. *Mesomyia.*
23. Antennae placed on the lower part of the head and directed downward. Face convex below the antennae in the female. Palpi large and swollen. Eyes bare. Ocelli absent (rarely with anterior ocellus). Proboscis of moderate length. First posterior cell as a rule closed and long-petiolate (in some species more or less open); fourth posterior cell open (very rarely closed). Fore tarsi of male without appendages. *Phara.*
Antennae not placed on the lower part of the head and not directed downward. Palpi small and slender.. 24.
24. Proboscis thick and only a little longer than the head, ending in two very large, blunt labella, which take about half the total length of the proboscis and are provided with rod-like processes on the inner surface. Ocelli absent. Eyes bare. First posterior cell closed and long-petiolate; fourth posterior cell open; fork of third longitudinal vein with an appendix.. *Subpangonia.*
Proboscis slender and often longer than the head, ending in narrow labella without rod-like processes.. 25.
25. First posterior cell closed and long-petiolate. Fork of third longitudinal vein with appendix. Eyes bare. Ocelli absent.. 26.
First posterior cell open or rarely closed just at the hind margin of the wing.......... 28.
26. Fourth posterior cell closed and long-petiolate. Wings relatively short and broad, bluntly rounded at the tip. Face of female convex beneath the antennae, but not produced into a long snout. Fore tarsi of male without appendages.............. *Dorcaloemus.*
Fourth posterior cell open or rarely closed just at the hind margin of the wing......... 27.
27. Face strongly swollen beneath the antennae and produced into a snout, often with shiny callosities. Fore tarsi of male as a rule with lappet-like processes at the apices of the first and second segments.. *Philoliche.*
Face merely convex beneath the antennae, not produced into a snout, as a rule without shiny callosities. Fore tarsi of male without appendages................ *Stenophara.*
28. Eyes pubescent. Ocelli present. Proboscis short or of moderate length. Face convex beneath the antennae, not snout-like.................................. *Scaptia.*
Eyes bare.. 29.
29. Ocelli present. Face convex beneath the antennae, not snout-like, without shiny areas or calli. Proboscis of moderate length, rarely longer than the thorax. Fore tarsi of male without appendages.. *Buplex.*
Ocelli absent.. 30.
30. Face convex beneath the antennae, not snout-like, without shiny areas. Proboscis of moderate length, rarely longer than the thorax. Fore tarsi of male without appendages.. *Ommatiosteres.*
Face very prominent and more or less snout-like beneath the antennae, as a rule with shiny areas or calli. Proboscis of variable length, often much longer than the thorax. First and second segments of fore tarsi in male often produced at the apex into tongue- or lappet-like processes.. *Nuceria.*

SUBFAMILY PANGONIINAE

Tribe Pangoniini

Silvius Meigen

Silvius Meigen, 1820, 'Syst. Beschreib. Europ. Zweifl. Ins.,' II, p. 27. Monotypic for *Tabanus vituli* Fabricius, 1805.

Perisilvius Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 344; 1925, *loc. cit.*, XI, 2, p. 316. Monotypic for *Perisilvius nyassicus* Enderlein, 1922.

The species generally placed in *Silvius* up to Enderlein's time certainly formed a heterogeneous group. Two of the genera accepted or proposed by

Enderlein for the African species, *viz.*, *Mesomyia* and *Dasycompsa*, seem to correspond to fairly natural divisions and comprise species that are undoubtedly not congeneric with *Silvius vituli* (Fabricius).

For the present, however, I cannot separate *Silvius* from *Perisilvius*. According to Enderlein, *Perisilvius* differs in lacking the appendix at the fork of the third longitudinal vein and in the short palpi, which are only one-third the length of the proboscis and end in a slender oval segment. The presence or absence of an appendix in the wing is a variable character and, in my opinion, not of generic value in this group. Of two females of *Silvius vituli* before me, one has a long appendix in each wing, while the other lacks even a trace of it in both wings. The different size of the palpi appears to be a common secondary sexual character in this group: they are often considerably smaller in the male, and the only specimen of *Perisilvius* seen by Enderlein was precisely of that sex. Szilády (1926, Zool. Anzeiger, LXVI, p. 327) also reached the conclusion that *Perisilvius* is not generically distinct from *Silvius*.

If the eyes of *Perisilvius nyassicus* Enderlein are actually bare in the male, as would appear from Enderlein's generic key, that species is probably a true *Silvius*. The following are also possibly members of this genus: *Silvius callosus* Ricardo (1920, Ann. South Afr. Mus., XVII, p. 529; ♀♂), of Natal, described as having bare eyes in the male and a lineal frontal callus in the female; *Silvius cuneatus* Loew (1858, Öfvers. Vet. Ak. Förhandl., XIV (1857), p. 338; ♀♂), of the Cape Colony, placed by Loew among the species with bare eyes and without projecting upper edge to the third antennal segment; it is described as having a lineal frontal callus in the female and is possibly the same as *S. callosus* Ricardo; and *Silvius confluens* Loew (1858, Öfvers. Vet. Ak. Förhandl., XIV (1857), p. 338; ♂), of the Cape Colony, similar to the foregoing, the fusion of the discal and third posterior cells of Loew's type being probably accidental. Neither of Loew's species has been studied in recent years or recognized again in South Africa.

Mesomyia Macquart

Mesomyia Macquart, 1850, 'Dipt. Exot.,' Suppl. IV, p. 37. Monotypic for *Mesomyia decora* Macquart, 1850. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 312.

Dasysilvius Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 343. Monotypic for *Pangonia variegata* Fabricius, 1805.

The above synonymy is after Enderlein (1925), since *Pangonia variegata* Fabricius is unknown to me.

Of the Ethiopian species formerly placed in *Silvius*, the following seem to belong to *Mesomyia*: *M. decora* Macquart (= *Silvius decipiens* Loew), *M. fallax* (Austen) (= *Silvius schoutedeni* J. Bequaert), *M. costata* (Loew), *M. hirsuta* (Ricardo), and *M. monticola* (Neave). All these species have hairy eyes and the third segment of the antenna more or less crescent-shaped. The generic position of *Erodiorhynchus pusillus* Schiner is doubtful, although the densely hairy eyes most likely place it near *Mesomyia*.

I have before me two males from Willowmore, Cape Colony (H. Brauns), which I refer to Loew's *Rhinomyza costata* (1860, 'Dipteren-Fauna Südafrikas,' I, p. 26; ♂), described from the Cape of Good Hope. The antennae of Loew's type were broken. The species was correctly recognized by Miss Ricardo (1914, Ann. South Afr. Mus., X, p. 451; ♀♂), and should be placed in *Mesomyia*.

I have also seen a male of *M. decora* Macquart (1850, 'Dipt. Exot.,' Suppl. IV, p. 38, Pl. II, figs. 10 and 10*a;* ♀), described from Natal. My specimen, from Bulawayo, Southern Rhodesia, agrees well with Loew's description of his *Silvius decipiens* (1858, Öfvers. Vet. Ak. Förhandl., XIV, (1857), p. 338; ♀; Caffraria), apart from sexual differences. I have followed Surcouf (1912, Bull. Mus. Hist. Nat. Paris, XVIII, p. 146) in regarding Loew's species as identical with Macquart's. The differences between *M. decora* and *M. hirsuta* (= *Silvius hirsutus* Ricardo, 1920, Ann. South Afr. Mus., XVII, p. 530; ♀♂; Cape Colony) are very slight and perhaps not of specific value.

Mesomyia fallax (Austen)

Silvius fallax Austen, 1912, Bull. Ent. Res., III, p. 113, fig. 1 (♀♂; between Petauke and Hargreaves, Luangwa Valley, Northeastern Rhodesia).

Silvius schoutedeni J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 231 (♂). New name for *Silvius fallax* Austen.

The new name *S. schoutedeni* was proposed at a time when both *Tabanus fallax* Macquart (1845) and *Silvius fallax* Austen (1912) were still included in *Silvius*. As pointed out by Austen (1913, Ann. Mag. Nat. Hist., (8) XI, p. 562), these two species are not congeneric and the change of name was unnecessary.

Female. — Eyes microscopically hairy. Looking like a small *Tabanus*, with reddish brown to slate-colored head and thorax, and rufous to dark brown abdomen; the tergites with a double series of rounded or transverse gray spots connected with the similarly colored hind margins which widen into triangles on the middle line. Wings hyaline, with very narrow or indistinct stigma. Frons more than twice as long as wide, with a large, quadrate basal callus. Third antennal segment with a prominent angle on the upper margin of the expanded base. Length, 10 to 12 mm.

Male. — Eyes densely hairy. Dorsum of thorax slate black. Abdomen with a broad, black, median, longitudinal stripe on the second, third and fourth tergites; the gray spots less conspicuous than in the female. Length, 9 to 12 mm.

I have taken one male of this species near Sankisia, in the Katanga District of the Belgian Congo. Otherwise *M. fallax* is known only from Northern Rhodesia.

Dasycompsa Enderlein

Dasycompsa Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 344; 1925, *loc. cit.*, XI, 2, p. 217. Monotypic for *Dasycompsa cincta* Enderlein, 1922.

In addition to the genotype, *Dasycompsa* comprises also *Silvius apiformis* Neave (1915, Bull. Ent. Res., V, p. 294, figs. 1 and 3; ♀♂), of Nyasaland, a female of which is before me. In *D. cincta* and *D. apiformis* the structure of the third antennal segment is the same [1] and in general appearance these two species are very similar and quite different from *Mesomyia*.

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[1] As corrected in the Errata, Fig. 2*a* of Neave's paper (1915) does not represent the antenna of *Silvius apiformis*, but that of *Silvius monticola*, in dorsal view.

Dasycompsa cincta Enderlein

Dasycompsa cincta Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 344 (without specific description); 1925, *loc. cit.*, XI, 2, p. 317 (♂; Sanaga, Cameroon).

BELGIAN CONGO. — Stanleyville, three females and two males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold, April 1915 (H. Lang and J. P. Chapin).

Female. — Ground color black, mostly covered with black hairs. First and second abdominal segments mostly yellowish white and with white hairs, the second tergite black before the pale hind margin; broad hind margins of the following segments also dirty white, with white fringes. Face, subcallus, and lower part of the frons white, with gray pollinosity; the face with long, white hairs. Sides of the thorax with white pile. Base of antennae, palpi, and basal half to two-thirds of tibiae white, with white pile. Third antennal segment gradually tapering from the broad base to the sharp apex. Frons one and one-third times as long as wide, almost parallel-sided, without basal callus, but with three faint, somewhat shiny, irregular, longitudinal spots about the middle. Ocelli very distinct. Eyes densely covered with short hairs, their lower inner corner (at the subcallus) more pronounced than usual. Wings yellowish subhyaline; base of wing (as far as the base of the basal cells) brownish; some of the cross-veins margined with pale yellowish brown; fork of third longitudinal vein without appendix; anal cell either very narrowly open or closed very near the margin of the wing. Length, 12 to 14.5 mm.; length of wing, 11 to 12 mm.

Male (undescribed). — Length, 11.5 to 13 mm.; width of head, 4.5 mm.; length of wing, 10 to 11 mm.

Colored almost exactly like the female. Eyes contiguous for a rather long distance. Ocelli prominent. Palpi exceptionally slender. Hair of the eyes longer and denser than in the female.

This species is closely allied to *D. apiformis* (Neave); but that species is much more extensively pale fulvous yellow on the abdomen (being rather fulvous with black fasciae), the second tergite is mostly fulvous with a median black spot, and the disk of the wing has a suffused dark area (much less distinct in the specimen seen than in Neave's figure).

D. cincta, which is known only from the Cameroon and the Belgian Congo, is probably the West African rain forest representative of the East African *D. apiformis.*

Pronopes Loew

Pronopes Loew, 1858, Öfvers. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 339; 1860, 'Dipteren-Fauna Südafrikas,' I, p. 26. Monotypic for *Pronopes nigricans* Loew, 1858.

This genus appears to be strictly South African. Two species have been described: *P. nigricans* Loew and *P. flavipes* Hine (1923, Ohio Jl. Sci., XXIII, p. 204; ♀♂; Willowmore, Cape Province).

Hinea C. F. Adams

Hinea C. F. Adams, 1905, Kansas Univ. Sci. Bull., III, p. 150. Monotypic for *Hinea flavipes* Adams, 1905 = *Silvius pertusus* Loew, 1858. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 321.[1] Mich. Bequaert, 1928, Rev. Zool. Bot. Afric., XVI, 1, p. 80.

Hineia C. F. Adams, 1905, Kansas Univ. Sci. Bull., III, p. 150. Misprint for *Hinea.*

A revision of this strictly Ethiopian genus has recently been published by Mich. Bequaert, who includes in it the following species: *Hinea flavipes* Adams,

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[1] From the references given by Enderlein it might be thought that Adams originally used the spelling *Hineia* only and that the form *Hinea* was a later emendation by Kertész. Such is, however, not the case, for Adams used both spellings on the same page of his paper, the generic description itself being headed "*Hinea.*"

Silvius pertusus Loew, *Rhinomyza rodhaini* J. Bequaert, *Rhinomyza praestabilis* Grünberg, *Hinea distincta* Ricardo, *Hinea nigra* Enderlein, and *Hinea dubiosa* Mich. Bequaert. Some of these are certainly identical. Thus *Hinea flavipes* and *Silvius pertusus* were based on the two sexes of one species; *Hinea distincta* is a synonym of *Rhinomyza praestabilis;* and I regard *Hinea nigra* as being the same as *Rhinomyza rodhaini.*

Moreover, I have reached the conclusion that two other poorly known African tabanids, thus far generally placed in *Silvius*, find a much more natural place in the genus *Hinea.* These are *Tabanus fallax* Macquart (1845, 'Dipt. Exot.,' Suppl. I, p. 32; ♀♂) and *Silvius glandicolor* Loew (1858, Öfvers. Vet. Ak. Förhandl., XIV, (1857), p. 338; ♂), both described from Caffraria and, moreover, possibly identical. Both agree in having bare eyes and a strongly toothed third antennal segment, a combination of characters which prevents their being included in either *Silvius* or *Mesomyia*, as defined in the present paper.[1]

The two species of *Hinea* known from the Belgian Congo may be separated as follows:

1. Wings blackish brown, with a few hyaline dots and some less dark areas, but without a pale cross-band. Head, antennae, palpi and most of the legs bright orange; thorax black; abdomen black, with the fifth to seventh segments mostly orange. Upper apex of second antennal segment produced into a long point. Vertex depressed between the eyes. Fork of third longitudinal vein with a short appendix. Length, 20 mm. . . . . *H. dubiosa.*

Wings blackish brown, with numerous hyaline or paler areas forming several incomplete cross-bands; the preapical band extending far into the second submarginal cell. Head, antennae, palpi, legs, thorax, and abdomen mostly brownish black to black; antennae and tibiae partly brownish red; second abdominal tergite with two large ill-defined brownish red spots. Upper apex of second antennal segment not produced. Vertex not depressed between the eyes. Fork of third longitudinal vein without appendix. Length, 16 mm. . . . . *H. rodhaini.*

Hinea dubiosa Mich. Bequaert

Hinea dubiosa Mich. Bequaert, 1928, Rev. Zool. Bot. Afric., XVI, 1, pp. 73 and 78, figs. 1, 2, 4, 6, and 7 (♀; Elisabethville, Katanga, Belgian Congo).

This species is known only from the type.

Hinea rodhaini (J. Bequaert)

Rhinomyza rodhaini J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 229, figs. 5 and 6 (♀; Kibombo, Belgian Congo).
Hinea rodhaini Mich. Bequaert, 1928, Rev. Zool. Bot. Afric., XVI, 1, pp. 71 and 79, figs. 3 and 5 (♀).
Hinea nigra Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 322 (♀; Neu Kamerun = French Middle Congo). Mich. Bequaert, 1928, Rev. Zool. Bot. Afric., XVI, 1, pp. 72 and 79 (♀).

BELGIAN CONGO. — Hemptinne-St.-Benoît near Luluabourg (P. Callewaert).

This specimen has the abdomen practically black, the paler spots of the second tergite being barely indicated. I am convinced that Enderlein's species is identical with *H. rodhaini*, which is known at present from the Belgian and French Congo.

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[1] According to Austen (1913, Ann. Mag. Nat. Hist., (8) XI, p. 562), "*Tabanus fallax* Macq. is not a *Silvius* but belongs to an at present undescribed genus allied to *Hinea.*"

Tabanocella Bigot

Tabanocella Bigot, 1856, Ann. Soc. Ent. France, (3) IV, pp. 62 and 76. Monotypic for *Silvius denticornis* Wiedemann, 1828. Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 342; 1925, *loc. cit.*, XI, 2, p. 321.

Rhinomyza Mich. Bequaert, 1928, Rev. Zool. Bot. Afric., XIV, 1, p. 81. Not of Wiedemann.

Provisionally I am following Enderlein in using the generic name *Tabanocella* for the African species thus far included in *Rhinomyza*. Originally Wiedemann's *Rhinomyza* was monotypic, including only *R. fusca* Wiedemann, of Java; the name must therefore be used for any generic group containing that species.[1] *R. fusca* has never been properly recognized, but it is very likely congeneric with the Oriental species now included in *Gastroxides* W. W. Saunders (= *Ditylomyia* Bigot), which then will become a synonym of *Rhinomyza* Wiedemann.

It must be admitted, however, that the character used by Enderlein to distinguish between *Tabanocella* and *Rhinomyza* is slight. In his table he mentions only the relative length of the first antennal segment (about three times as long as thick in *Rhinomyza* and about twice as long as thick in *Tabanocella*) and gives no additional differences in his generic descriptions.

Tabanocella now comprises twelve species, five of which occur in Madagascar, the remainder on the African continent. On account of the complete lack of a basal projection to the third antennal segment, *Rhinomyza simplicicornis* Austen would seem to belong in *Silvius*, where I have placed it provisionally.

KEY TO THE SPECIES OF *Tabanocella* OF THE BELGIAN CONGO

1. Abdomen yellow to brownish yellow, with two dorsal, longitudinal, brownish black bands (removed from the extreme sides) on the second tergite. Dorsum of thorax uniformly darkened, without traces of longitudinal bands. Apical spot of wing reaching the lower branch of the third longitudinal vein; the infuscate spot at the tip of the anal cell connected with the median band of the wing along the hind margin. Fore tarsi entirely black. Length, 12 to 13 mm. . . . . *T. perpulcra.*

Abdomen yellow to brownish yellow, usually with some darker spots or transverse fasciae, which sometimes cover whole segments of the abdomen . . . . 2.

2. Median dark band of the wing not reaching the hind margin, not or hardly extending into the fifth posterior cell; the distal half of the first basal cell mostly hyaline, except for a small apical spot; apical spot of wing faint, not extending beyond the upper branch of the third longitudinal vein. Frontal callus narrowly triangular, much narrower than the frons at the base and drawn out into a long point. Digitiform process of third antennal segment moderately slender. Dorsum of thorax as a rule with more or less distinct longitudinal dark stripes . . . . 3.

Median dark band almost or quite reaching the hind margin of the wing, always covering much of the apex of the fifth posterior cell; the distal half of the first basal cell mostly dark, sometimes with a hyaline spot; apical spot of wing strongly marked, covering most of the second submarginal cell. Frontal callus more broadly triangular, nearly as wide as the frons at the base and ending in a blunt apex. Dorsum of thorax uni-

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[1] Curiously enough, *R. fusca* is not even mentioned by J. H. Schuurmans-Stekhoven in his recent revision of the East Indian Tabanidae (1926, Treubia, VI, Supplement).

formly colored. Digitiform process of third antennal segment very slender. Length, 11 to 14 mm. . . . . *T. stimulans.*

3. Lower part of the face without a brownish black spot. First two abdominal tergites pale dirty yellowish, the second with a median dark brown triangular spot narrowly connected with similar lateral spots. Frons about four times as long as wide at the vertex, where it is distinctly narrowed. Length, 11.5 to 13 mm. . . . . . . *T. umbraticola.*

   Lower part of the face with a brownish black spot. First two abdominal tergites pale dirty yellowish with narrow, darker, brownish hind margins. . . . . 4.

4. Basal division of third antennal segment more slender, the tip of the digitiform process not quite extending to the base of the second division. Frons about three and one-half times as long as wide at vertex, where it is scarcely narrowed. Length, 12 mm. . . . . *T. concinna.*

   Basal division of third antennal segment thicker, the tip of the digitiform process extending well beyond the base of the second division. Frons about four times as long as wide at vertex, where it is distinctly narrowed. Length, 11 to 13 mm. . . . . *T. innotata.*

Tabanocella stimulans (Austen)

Rhinomyza stimulans Austen, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 354 (♀; Benue River, between Bagana and Lokoja, Northern Nigeria). Grünberg, 1913, Entom. Rundschau, XXX, p. 100 (♀ ♂). Schouteden, 1929, Rev. Zool. Bot. Afric., XVII, 2, p. 240.

Rhinomyza lutosa Grünberg, 1913, Entom. Rundschau, XXX, p. 100 (♀; Bipindi, Cameroon).

Belgian Congo. — Lolo, Itimbiri River, one female (J. Rodhain). Medje, three females; Niangara, one female; Stanleyville, seven females and one male, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Macaco near Luebo, one female, October 1, 1921 (H. Schouteden).

I have carefully compared the specimen from Macaco with the holotype at the British Museum. There is a good deal of variation in the extent of dark brown markings of the abdomen among these Congo specimens and some of the other characters likewise are rather variable. One may readily be tempted to describe some extreme individual variations as distinct species. Even the length of the upper apex of the second antennal segment does not appear to be fixed: some specimens have it very long and others much shorter; but there are intermediate examples and, moreover, these variations are not correlated with other differences. The extent of the infuscation in the apex of the anal cell is also subject to variation, but I do not believe it can be used as a specific character.

In all the specimens listed above the dark median and apical bands of the wing are broadly connected along the costa, the hyaline triangle not extending into the marginal cell. This is however not the case in a female from Leopoldville (J. Rodhain) and another from Lokandu (H. Schouteden), in which the hyaline triangle stops only a short distance from the costa. I cannot believe that this difference is of specific value.

R. lutosa Grünberg is, in my opinion, a mere individual variation of *T. stimulans*, without trace of dark abdominal markings.

T. stimulans is a West African species known from Sierra Leone, the Gold Coast, Southern Nigeria, Cameroon and the Belgian Congo. Dr. Schouteden observed that it was attracted by light after dusk, at Lokandu.

Tabanocella umbraticola (Austen)

Rhinomyza umbraticola Austen, 1911, Bull. Ent. Res., I, p. 289, fig. 4 (♀; High plateau south of Lake Tanganyika, Northeastern Rhodesia).

This species is known only from Northeastern Rhodesia and the Katanga District of the Belgian Congo. I have before me one of the paratypes collected by S. A. Neave in the mid-Lualaba Valley, at an altitude of 3000 ft., and identified by Austen. It is extremely close to *T. innotata* from which it differs in lacking the brownish black spot in the lower part of the face, in the dorsum of the thorax at most faintly striped, and in the first two abdominal tergites not being pale yellowish with narrow dark brownish hind margins; instead the first tergite is entirely pale dirty yellowish, while the second is dirty yellowish with an irregular dark brown median triangle not reaching the hind margin and narrowly connected with dark brown lateral spots. The frons is like that of *T. innotata*, if anything a little more narrowed toward the vertex; antennae are lacking. Whether *T. umbraticola* and *T. innotata* are specifically distinct remains somewhat doubtful.

Tabanocella innotata (Karsch)

Silvius innotatus Karsch, 1888, Berlin. Ent. Zeitschr., XXXI, 2, (1887), p. 372, Pl. IV, fig. 6 (♀; Usambara, Tanganyika Territory).

Rhinomyza innotata S. A. Neave, 1912, Bull. Ent. Res., III, pp. 285, 313, 315, and 317 (♀).

Rhinomyza bifasciata Grünberg, 1913, Entom. Rundschau, XXX, p. 99 (♀; Amani, Tanganyika Territory).

Belgian Congo. — Panda River, one female, taken in the forest gallery, September 1920 (Mich. Bequaert).

This specimen agrees in every respect with Karsch's and Grünberg's descriptions. Grünberg evidently overlooked Karsch's *S. innotatus;* his *R. bifasciata* came from the same region as Karsch's species, Amani being situated in the Usambara District.

T. innotata is an East African species known from Tanganyika Territory, Nyasaland, Northern Rhodesia and the Katanga.

T. concinna (Austen) (= *Rhinomyza concinna* Austen, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 352; ♀; West Nyasa, Nyasaland), of which I have before me a female from the Kafue River, Northern Rhodesia (October 22, 1923. — Mich. Bequaert), is extremely close to *T. innotata*. It seems, however, to be a valid species. As pointed out by Grünberg, in *T. concinna* the basal division of the third antennal segment is more slender so that the digitiform process does not quite extend to the base of the second division (in *T. innotata* it extends well beyond the base of the second division). In addition, the frons is decidedly wider and scarcely narrowed toward the vertex (about three and one-half times as long as wide at the vertex in *T. concinna;* about four times, in *T. innotata*) and the frontal callus has a somewhat different shape.

The specimen of *T. concinna* from the Kafue River bears a collector's note that it was taken in the forest gallery and was flying at dusk. This is interesting in view of Neave's observation that two specimens of *T. innotata* were biting a native on the shore of Lake Nyasa shortly after sunset (1912, Bull. Ent. Res., III, p. 285) and of Schouteden's capture of *T. stimulans* after dusk.

Since *T. concinna* is likely to be found in Katanga, it has been included in my key.

Tabanocella perpulcra (Austen)

Rhinomyza perpulcra Austen, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 349 (♀; Kasala Stream near Mpumu, Uganda).

This species has also been recorded from the Kavirondo District of Kenya Colony, the fauna of which is West African. Some years ago I saw a female from Medje, Belgian Congo (H. Lang and J. P. Chapin), which at the time seemed to be *T. perpulcra;* but the specimen is no longer available, so that the occurrence of this species in our territory remains doubtful.

Thriambeutes Grünberg

Thriambeutes Grünberg, 1906, Zool. Anzeiger, XXX, p. 352. Monotypic for *Thriambeutes singularis* Grünberg, 1906. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, pp. 306 and 309.

In a recent paper (1927, Amer. Mus. Novitates, No. 285, pp. 1–4), Hine has attempted to show that the characters assigned to *Thriambeutes*, *Orgizomyia* and *Guyona* are more properly specific than generic. I am strongly inclined to the same view. However, since no specimens of either *Pangonia mesembrinoides* or *Pangonia zigzag* are available, I shall provisionally treat the three genera as distinct. The only characters that seem at all reliable have been given in the key. It will be noted that *Guyona* is transitional between *Orgizomyia* and *Thriambeutes*, combining the broad, toothed third antennal segment of the former with the stout palpi of the latter.

The genus is exclusively Ethiopian and known by three species. Two of these occur in the Belgian Congo and may be separated as follows:

1. Both sexes colored alike. Head and thorax coal black; abdomen bright ferruginous red. Antennae, palpi and fore legs black; middle and hind legs ferruginous red, the middle femora infuscated. Wings uniformly very dark smoky. Length, 10 to 16 mm. . . . . *T. austeni.*

   The two sexes differently colored. Female: head, antennae, palpi and thorax bright ferruginous red; abdomen and legs coal black. Male: entirely ferruginous and covered with golden yellow pubescence, except the legs which are black. Wings infuscated, with hyaline spots and bands as follows: a spot at the base of the wing; a narrow, oblique cross-band just before the discal cell extending from the first longitudinal vein to the hind margin; a small round spot in the basal half of the discal cell. The apical third of the wing beyond the discal cell is hyaline except for a narrow smoky band along the anterior margin reaching the tip of the wing and separated from the main brown area on the costa. Length, 11.5 to 13 mm. . . . . *T. singularis.*

Thriambeutes austeni (Hine)

Orgizomyia austeni Hine, 1927, Amer. Mus. Novitates, No. 285, p. 3 (♀ ♂; Stanleyville, Belgian Congo).

This species is known only from the type locality where numerous specimens were taken as prey of *Bembix bequaerti* Arnold var. *dira* Arnold.

Thriambeutes singularis Grünberg

Thriambeutes singularis Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 353, figs. 4–6 (♀; Misahöhe, Togo). Austen, 1920, Bull. Ent. Res., XI, p. 152 (♂).
Thriambeutes flaviventris Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 310 (♂; Nkolentangan, Spanish Guinea).

BELGIAN CONGO. — Stanleyville, one female and one male, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

T. singularis is a fly of the West African rain forest, known from Togo, Southern Nigeria, Spanish Guinea, and the Belgian Congo.

Orgizomyia Grünberg

Orgizomyia Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 349. Monotypic for *Pangonia zigzag* Macquart, 1855.
Orgyzomyia Surcouf and Gonzalez-Rincones, 1912, 'Essai Dipt. Vulnér. Venezuela,' II, p. 109. Misspelling of *Orgizomyia*.
Methoria Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, pp. 256 and 257. Monotypic for *Pangonia zigzag* Macquart, 1855.

This genus contains only one species from Madagascar.

Guyona Surcouf

Guyona Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 140. Monotypic for *Pangonia mesembrinoides* Surcouf, 1908.

This genus contains only one species, from Tanganyika Territory.

Enderlein (1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 307) separates *Guyona* from *Orgizomyia* and *Thriambeutes* on the strength of the shape of the subcallus; but this is an error. In all three genera the subcallus bearing the antennae is prominent. Surcouf describes it for *Pangonia mesembrinoides* as follows: "région subantennaire saillante, cylindrique, noire."

Triclida Enderlein

Triclida Enderlein, 1923, Deutsch. Ent. Zeitschr., p. 544; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 328. Type by original designation: *Triclida lurida* Enderlein, 1923.
Stypotriclida Enderlein, 1923, Deutsch. Ent. Zeitschr., p. 544; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 328. Monotypic for *Bouvierella chopardi* Surcouf, 1913.
Triclidommisa Enderlein, 1923, Deutsch. Ent. Zeitschr., p. 544; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 330. Monotypic for *Triclidommisa hildebrandti* Enderlein, 1923.

Enderlein is perhaps justified in removing from *Bouvieromyia* the species in which the upper base of the third antennal segment forms no projecting tooth. His further subdivision of this group, based upon the presence or absence of an appendix to the fork of the third longitudinal vein and upon the structure of the eyes in the male, appears to be artificial.

As here defined, *Triclida* comprises most of the species formerly placed in *Bouvierella*, some fourteen in all, distributed over the Malagasy Subregion (Madagascar, the Seychelles, and the Comoros).

Bouvieromyia Strand

Bouvierella Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 176. Type by designation of Enderlein (1922): *Bouvierella notata* Surcouf, 1909. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 327. Not *Bouvierella* Chevreux, 1900.

Bouvieromyia Strand, 1928, Arch. f. Naturgesch., XCII, (1926), Abt. A, Heft 4, p. 73. New name for *Bouvierella* Surcouf, 1909, not of Chevreux, 1900.

Most of the species formerly placed in *Bouvierella* appear to belong in *Triclida.* Of the described species only two remain in *Bouvieromyia*, the genus being then restricted to Madagascar.

Aegophagamyia Austen

Aegophagamyia Austen, 1912, Ann. Mag. Nat. Hist., (8), IX, p. 12. Type by original designation: *Aegophagamyia pungens* Austen, 1912.

Aegophagomyia Aders, 1917, Bull. Ent. Res., VII, p. 398. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, pp. 325 and 326.

Seven species have been described in this genus, which is almost restricted to Madagascar and some of the islands in the Indian Ocean. One species is found in Zanzibar and Pemba Island, as well as on the coast of Kenya Colony.

Enderlein transfers *Bouvierella flava* Surcouf to *Aegophagamyia* and, if this procedure were to be followed, *Bouvierella interrupta* Bezzi would likewise be placed here, at least on the strength of the wing venation. I doubt, however, that the relative lengths of the stalks of the first and fourth posterior cells are of generic or even of specific value. *Bouvieromyia*, *Triclida*, and *Aegophagamyia* appear to be very poorly defined as genera. *Bouvieromyia inornata* (Austen), of which I have seen at the U. S. National Museum a female from Glorioso Island (W. L. Abbott), combines the slender proboscis and wing venation of *Aegophagamyia* with the frontal callosity of *Bouvieromyia*. This species, as Austen recognizes, is an annectent link between the two genera.

Rhigioglossa Wiedemann

Rhigioglossa Wiedemann, 1828, 'Aussereurop. Zweifl. Insekten,' I, p. 105. Monotypic for *Rhigioglossa testacea* Wiedemann, 1828 = *Rhinomyza edentula* Wiedemann, 1828. J. Bequaert, 1924, Psyche, XXXI, p. 30.

Erodiorhynchus Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 110. Monotypic for *Erodiorhynchus eristaloides* Macquart, 1838 = *Rhinomyza edentula* Wiedemann, 1828. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 308.

Scarphia Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 10. Monotypic for *Pangonia directa* Walker, 1850 = *Rhinomyza edentula* Wiedemann, 1828. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 325.

Metoponaplos Ricardo, 1915, Arch. f. Naturgesch., LXXX, (1914), Abt. A, Heft 8, p. 124. Monotypic for *Pangonia parva* Walker, 1848 = *Rhinomyza edentula* Wiedemann, 1828.

The earliest valid name for this genus is *Rhigioglossa*, used by Wiedemann for a synonym of his *Rhinomyza edentula*. It appears to be a strictly South African group, represented by two species: *R. edentula* (Wiedemann) (= *Rhinomyza edentula* Wiedemann, 1828; *Rhigioglossa testacea* Wiedemann, 1828; *Erodiorhynchus eristaloides* Macquart, 1838; *Pangonia parva* Walker, 1848; and *Pangonia directa* Walker, 1850) and *R. nigricans* (Ricardo). I am not positive, however, that the last-named species is strictly congeneric with *R. edentula.*

Enderlein places *Erodiorhynchus* and *Scarphia* in different subfamilies, the former in his Silviinae, the latter in his Scarphiinae. These, however, are separated only by the first posterior cell being either open (in Silviinae) or closed (in Scarphiinae). The character is certainly not of subfamily value. Moreover, Miss Ricardo, who examined the types of both *Pangonia directa* and *P. parva*, states that all the posterior cells are widely open. This is also the case in the one specimen I have seen of *R. edentula.* If the specimen examined by Enderlein was correctly named and actually had the first posterior cell closed, this must have been accidental.

Phara Walker

Phara Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 9. Type by designation of Austen (1920): *Pangonia melanopyga* Wiedemann, 1819. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 283 (in part).

Cadicera Macquart, 1855, 'Dipt. Exot.,' Suppl. V, p. 23. Monotypic for *Cadicera rubramarginata* Macquart, 1855.

Phara appears to be exclusively Ethiopian. The genus is here used as emended by Austen (1908, Ann. Mag. Nat. Hist., (5), I, pp. 211–212; and 1912, Bull. Ent. Res., III, pp. 117–122) to include not only the very broad species related to the genotype, but also others of a more slender build, such as *Cadicera flavicoma* Austen (1912), *Corizoneura obscura* Ricardo (1908), and *Cadicera speciosa* Austen (1912), which are somewhat transitional to *Ommatiosteres.* Since the genus is as yet unknown from the Belgian Congo, I shall refrain from any further discussion. As several species have been found in Tanganyika Territory and Rhodesia, perhaps some will be discovered in Katanga.

Subpangonia Surcouf

Subpangonia Surcouf, 1908, Bull. Mus. Hist. Nat. Paris, XIV, p. 284. Monotypic for *Subpangonia gravoti* Surcouf, 1908. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 284.

This genus is known from the Ethiopian Region only, where it is, moreover, restricted to the rain forests of the West African Subregion. Only two species are known: *S. gravoti* Surcouf and *S. grahami* Austen.

The remarkable proboscis of *Subpangonia* has been described by Austen (1912, Bull. Ent. Res., III, p. 126) in the following terms: "This organ which, in dead specimens at any rate, slants downwards at an obtuse angle with the longitudinal axis of the body, is of only moderate length or relatively short, and, instead of being slender and needle-like in appearance, looks thick and fleshy. The most striking external features of the proboscis are exhibited by the labella, which, instead of being small, inconspicuous, and narrow at the tips, are extraordinarily large, blunt-ended, and rather longer than or at least as long as half the total length of the proboscis. From the upper margin of the inner surface of each labellum there projects downwards, at an angle with the axis of the proboscis, a series of light-colored or reddish, rod-like processes, which are broader at the base and narrower at the tip, and diminish successively in length. Each labellum apparently bears ten or eleven of those rod-like structures, the proximal five or six of which are longer than the remainder, and (in dead specimens at any rate) protrude conspicuously below the lower ends of the rest, of which the extreme tips alone are visible from the outer side.

Surcouf (1908, Bull. Mus. Hist. Nat. Paris, XIV, p. 284) describes the rod-like processes as 'almost completely closed tubes,' and says that their function would appear to be to assist the insect in sucking up blood or other fluids. By means of a mere external examination the present writer has not been able to satisfy himself that the bodies in question are really tubular, and their precise structure and significance remain to be determined; meanwhile the attention of the reader may be directed to the existence of apparently homologous processes on the inner surfaces of the labella in *Dorcaloemus silverlocki* Austen and *Pangonia comata* Austen."

The extraordinary pectinate labella are equally developed in both sexes, which renders it rather improbable that they are used in sucking blood, since no males of Tabanidae are known to be hematophagous. It is more likely that these insects feed upon juices of plants, either visiting flowers, or, as Surcouf suggests, imbibing the sap of wounded trees.

Subpangonia gravoti Surcouf

Subpangonia gravoti Surcouf, 1908, Bull. Mus. Hist. Nat. Paris, XIV, p. 284 (♀; N'tem Basin, French Congo); 1921, 'Gen. Insect., Tabanidae,' p. 102, Pl. III, figs. 9*a-b* (♀). Ricardo, 1915, Arch. f. Naturgesch., LXXX, (1914), Abt. A, Heft 8, p. 124 (♀ ♂).

BELGIAN CONGO. — Stanleyville, four males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

Head and thorax black, clothed with pale ochreous hair, denser on the under side and on the sides of the dorsum. First three abdominal segments ochreous; the remainder more brownish; the hind borders narrowly fringed with ochreous pubescence. Antennae dark chocolate brown; palpi and legs brownish black. Wings slightly infuscated throughout, with a somewhat yellowish tinge. Length, 12.5 to 13 mm.

Both sexes are colored alike.

S. gravoti is known from Southern Nigeria, Cameroon, and the French and Belgian Congo.

Metaphara Enderlein

Metaphara Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 342; 1925, *loc. cit.*, XI, 2, p. 325. Type by original designation: *Pangonia multifaria* Walker, 1848.

This genus is characterized by Enderlein as follows. No ocelli. Fork of third longitudinal vein with appendix. First posterior cell closed before the margin. Third antennal segment composed of five divisions only. Proboscis longer than the head; palpus very short, pointed and slender. He includes in it, besides the genotype, also *Pangonia thoracica* Wiedemann, 1828. If these two species, which are both South African, actually show the above characters, they may form a valid genus. Since neither of them is known to me, I am provisionally following Enderlein.

Philoliche Wiedemann

Philoliche Wiedemann, 1828, 'Aussereurop. Zweifl. Insekten,' I, p. 95. Type by designation of Coquillett (1910): *Tabanus rostratus* Linnaeus, 1764.

Nuceria Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 339; 1925, *loc. cit.*, XI, 2, p. 281. Type by original designation: *Tabanus rostratus* Linnaeus, 1764. Not *Nuceria* Walker, 1850.

Enderlein overlooked Coquillett's selection of the type species for both *Philoliche* Wiedemann and *Nuceria* Walker, which makes his genus *Nuceria* an exact synonym of *Philoliche.*

Philoliche rostrata (Linnaeus) does not appear to be strictly congeneric with the genotype of *Pangonius* Latreille, which by designation of Latreille (1810) and Coquillett (1910) is *Tabanus proboscideus* Fabricius, 1794 (= *Pangonia maculata* Fabricius, 1805), and Enderlein is probably right in restricting *Pangonius* to the Palaearctic species.

Of the Ethiopian species generally placed in *Pangonia*, those with bare eyes and the first posterior cell normally closed far before the margin of the wing appear to form four fairly natural groups:

(1) *Tabanus rostratus* Linnaeus and allied species have the face of the female strongly swollen beneath the antennae and produced into a snout. They differ, moreover, from *Pangonius*, proper, in lacking the ocelli, while in some species, such as *T. rostratus*, the fore tarsi of the male have the apices of the first and second segments produced into lappet-like processes. If this group be regarded as a distinct genus, it should be called *Philoliche.*

(2) *Pangonia zonata* Walker and allied species differ also from *Pangonius*, proper, in lacking the ocelli, but the face is merely convex beneath the antennae, not conspicuously snout-like. So far as known, the males of this group do not have the lappet-like processes of the fore tarsi found in *T. rostratus.* For this group the generic name *Stenophara* Enderlein might perhaps be retained.

(3) A compact group of three or four South African species agree in most respects with *Stenophara;* but the fork of the third longitudinal vein not only bears an appendix to the upper branch, but the lower branch also is provided with a much shorter appendix projecting in the second submarginal cell. Enderlein used the generic name *Philoliche* for this group; but if one follows Coquillett's selections of genotypes, that name must be applied to the group of *Tabanus rostratus.* The additional stump of vein does not seem of sufficient value to warrant the creation of a new generic or subgeneric term and I leave these species provisionally in *Stenophara.*

(4) A number of species show the same differences from *Pangonius*, proper, as the group here called *Stenophara*, but they have the fourth posterior cell also closed far before the margin and the wings are rather short and broad, with bluntly rounded apex. For this group Austen has proposed the generic name *Dorcaloemus.*

Having been able to examine only a few of the many Ethiopian species that might be brought in the foregoing four groups, I cannot decide whether the above arrangement corresponds to a natural grouping or is merely artificial. I am rather inclined to the latter view. The swelling of the face appears to show all stages from being merely convex (as in *Pangonia ramulifera* Loew) to strongly snout-like (as in *Tabanus rostratus* Linnaeus). It is evidently correlated with the length of the proboscis and, like that character, purely adaptive. Enderlein places *Pangonia infusca* Austen and *Pangonia oldii* Austen in his genus *Nuceria* (which corresponds to my *Philoliche*), although both species are undoubtedly close allies of *Pangonia zonata* Walker, which is the type of his genus *Stenophara*. It is also open to question whether *all* the so-called "*Pangoniae*" of the Ethiopian Region with the first posterior cell normally closed before the margin actually have bare eyes and no ocelli.

However, since valid names are available for three of the groups distinguished above, I shall provisionally use them in a generic sense.

Two species recorded from the Belgian Congo appear to belong in *Philoliche* as defined above, although their males do not possess the lappet-like appendages of the fore tarsi. The face, however, forms a projecting snout, the size of which is evidently correlated with the length of the proboscis; it bears shiny callosities.

In the absence of specimens the exact generic status of many African "*Pangoniae*" is open to question, so that the distribution of *Philoliche* can be given only in a general way. The genus appears to be restricted to the East-and-South African Subregion and is not known outside the African continent.

The two species of the Belgian Congo agree in having the hind corners of the second, fourth, and fifth abdominal tergites covered with yellowish white hair which extends as a fringe along the apical margins; the legs are mostly chestnut-brown, the fore and middle tibiae ochraceous-buff, clothed with pale yellowish hair; the antennae and palpi are ferruginous or orange-rufous; the proboscis is at least half as long as the body (7 to 12 mm.). They may be separated as follows:

1. Blackish brown, with first two abdominal segments tawny, sometimes more or less clove-brown; the middle of third segment often somewhat tawny; the hind borders of all the segments lighter. Shiny facial callosities extending to front margin of buccal cavity in male. Hind margin of second ventral segment fringed with silvery white hairs in male. Length, 15 to 18 mm. . . . . *P. oldii.*

   Blackish brown, the abdomen uniformly clove-brown with lighter hind borders of segments. Shiny facial callosities not extending to front margin of buccal cavity. Second ventral segment without shiny white pilosity on the hind border in male. Length, 15 to 18 mm. . . . . *P. infusca.*

Philoliche infusca (Austen)

Pangonia infusca Austen, 1911, Bull. Ent. Res., I, p. 283 (♀♂; mid-Lualaba Valley, 3,000 ft., Belgian Congo).

Pangonia austeni J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 225 (in part: ♂; not ♀).

This species is known only from the Katanga District of the Belgian Congo.

Philoliche oldii (Austen)

Pangonia oldii Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 215 (♀♂; Nangondo Stream, Masanji-Shiré District, Nyasaland).

This species, which is known from Nyasaland and Southern Rhodesia, has also been reported from several localities in the Katanga District of the Belgian Congo.

Stenophara Enderlein

Stenophara Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 340; 1925, *loc. cit.*, XI, 2, p. 284. Type by original designation: *Pangonia zonata* Walker, 1871.

Philoliche Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 339; 1925, *loc. cit.*, XI, 2, p. 285. Type by original designation: *Pangonia angulata* Fabricius, 1805. Not *Philoliche* Wiedemann, 1828.

So far as can be judged at present, *Stenophara* appears to have much the same distribution as *Philoliche*, being likewise strictly Ethiopian. In the Belgian Congo it is represented by one species.

Stenophara rodhaini (J. Bequaert)

Pangonius rodhaini J. Bequaert, 1924, Rev. Zool. Afric., XII, 4, p. 462 (♀; Luki, Belgian Congo).

This species is known only from the type locality in the Lower Congo.

Female. — Head and thorax black; the dorsum dark pollinose, with lighter markings faintly indicated anteriorly and on the sides. Abdomen smoky yellowish brown on the first three segments, passing into blackish brown posteriorly; the ventral side paler yellowish brown; second, fourth, and fifth tergites with narrow white apical fringes which broaden into spots in the hind corners. Antennae, palpi and legs dark chestnut-brown to black, with black hair. Face without shiny callosities; beard white. Proboscis not much longer than the height of the head (3 mm.), bluntly ending in large labella. Wings fairly uniformly and strongly smoky brown throughout. Length, 12 to 14.5 mm.

Male unknown.

Dorcaloemus Austen

Dorcaloemus Austen, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 357. Type by original designation: *Pangonia compacta* Austen, 1908. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 299.

Dorcalaemus Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 112. Misspelling of *Dorcaloemus* Austen.

This Ethiopian genus appears to be strictly East African, the seven species known at present to belong here being found in Abyssinia, Kenya Colony, Nyasaland, Southern and Northern Rhodesia and the Katanga District of the Belgian Congo.

The three species of the Congo may be separated by the following key:

1. Male and female: Smaller, 11 to 14.5 mm. long. Dorsum of thorax dark olive-yellow pollinose. First three segments of abdomen bright ochraceous, the remainder black with lighter hind borders. The second segment with a median black spot on the anterior margin. Hind margins of second and following segments with transverse bands of pale shiny hair, silvery-white anteriorly, more yellowish behind. Wings tinged with luteous (more brownish in the subspecies *centralis*, which does not reach the Belgian Congo).. *D. compactus.*

   Averaging larger, 13 to 16.5 mm. long. Dorsum of thorax dark olive-brown, grayish pollinose. Abdomen black above; the hind margins of first, second, and third segments with broad bands of pale pubescence, which also covers the hind margins or whole of the fourth and following segments. Wings light mummy-brown, darker along the veins, in the costal cells and stigma................................ 2.

2. Female: Hairy covering of distal extremity of abdomen and hind margins of second, third, and fourth segments bright golden-yellow. Male unknown...... *D. auricomus.*

   Male and female: Hind margins of second, third, and fourth abdominal segments silvery-white; hind margins only of fifth and sixth segments with golden-yellow hair. .... *D. candidolimbatus.*

Dorcaloemus compactus (Austen)

Pangonia compacta Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 212 (♀; Salisbury, Southern Rhodesia); 1909, 'Illustr. African Blood-Suck. Flies,' p. 61, Pl. IV, fig. 28 (♀). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 226 (♀ ♂); 1924, Psyche, XXXI, p. 34.

This species has been taken at Bukama and Sankisia in the Katanga. In March 1911, both sexes were observed at Bukama visiting the flowers of *Borreria* *dibrachiata* (Oliver), one of the Rubiaceae: the flies hover and probe the corolla without resting on the flower.

D. compactus is known from Portuguese East Africa, Nyasaland, Northern and Southern Rhodesia, the Katanga, Tanganyika Territory, and Kenya Colony.

Dorcaloemus auricomus Austen

Dorcaloemus auricomus Austen, 1911, Bull. Ent. Res., I, p. 286, fig. 3 (♀; Mid-Lualaba Valley, 3,000 ft., Katanga).

This species has thus far been recorded only from the Katanga. I have, however, before me two females from Sawmills, Southern Rhodesia (R. H. R. Stevenson).

Dorcaloemus candidolimbatus Austen

Dorcaloemus candidolimbatus Austen, 1911, Bull. Ent. Res., I, p. 288 (♀ ♂; mid-Lualaba Valley, Katanga). J. Bequaert, 1924, Psyche, XXXI, p. 34.
Pangonia candidolimbata J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 226 (♀ ♂).

This species is known only from the Katanga District of the Belgian Congo.

Scaptia Walker

Scaptia Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 8. Type by designation of Coquillett (1910), accepted by Enderlein (1922): *Pangonia aurata* Macquart, 1838. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 278. Ferguson, 1926, Bull. Ent. Res., XVI, 4, pp. 298 and 302.
Osca Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 10. Type by designation of Coquillett (1910): *Pangonia depressa* Macquart, 1837 = *Tabanus latus* Guérin, 1835. Brèthes, 1914, Bull. Soc. Ent. France, p. 59. Austen, 1920, Bull. Ent. Res., XI, p. 139. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 273.
Diatomineura Rondani, 1863, Archiv. Zool. Anat. Fisiol. Canestrini, III, p. 84. Type by designation of Coquillett (1910): *Pangonia depressa* Macquart, 1837 = *Tabanus latus* Guérin, 1835.
Pseudoscaptia Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 338; 1925, *loc. cit.*, XI, 2, p. 277. Type by original designation: *Pseudoscaptia scoliiformis* Enderlein, 1922.

Enderlein separates *Pseudoscaptia* from *Osca* solely by the relative size and shape of the palpi: in the former, they are half the length of the proboscis, with the terminal segment not pointed at apex, not excavated on the outer side and circular in cross-section; in the latter, they are over half the length of the proboscis, with the terminal segment strongly pointed apically. I do not believe that such slight differences are of more than specific (or perhaps only sexual) value. Somewhat similar characters are used by Enderlein to differentiate *Scaptia* and *Osca*, but Ferguson (1926) has shown that the Australian species vary considerably in the relative size of the palpi. Since *Scaptia* has page priority it should supersede *Osca*.

To *Scaptia* appear to be referable the few Ethiopian so-called "*Pangoniae*" with pubescent eyes. The eyes are described as hairy in *S. senegalensis* (Macquart) and *S. scoliiformis* (Enderlein), both placed by Enderlein in his genus *Pseudoscaptia* (here regarded as not separable from *Scaptia*). Austen includes in *Osca* the Ethiopian *Tabanus barbatus* Linnaeus and *Pangonia fulvifascia* Walker; but Enderlein lists these two species in his genus *Corizoneura* (= *Buplex* Austen) which is characterized by bare eyes. With *Tabanus barbatus* Linnaeus he synonymizes *Pangonia alternans* Macquart and, if this synonymy is correct, the species could not belong in *Scaptia,* since *P. alternans* is described as having bare eyes. Surcouf (1921, 'Gen. Insect., Tabanidae,' p. 134) lists *Pangonia fasciata* Macquart as a variety of *Tabanus barbatus* Linnaeus, which he places in *Corizoneura,* but gives no reasons for doing so; Macquart's description of *P. fasciata* does not mention the eyes. As for *Pangonia fulvifascia,* Enderlein refers it with doubt to his genus *Corizoneura* and Walker's description is silent about the eyes.

Provisionally I include in *Scaptia* three Ethiopian species: *S. senegalensis* (Macquart), *S. scoliiformis* (Enderlein), and *S. fulvifascia* (Walker), the first one described from the Senegal, the other two from South Africa. None of these occur in the Belgian Congo, where the genus *Scaptia* is not represented so far as known.

Buplex Austen

Buplex Austen, 1920, Bull. Ent. Res., XI, p. 139. Type by original designation: *Pangonia suavis* Loew, 1858.

Although several of the African species included by Enderlein in his genus *Corizoneura* (not *Corizoneura* Rondani, which equals *Nuceria* Walker) belong in *Buplex* Austen,[1] Enderlein's *Corizoneura* does not seem to be strictly synonymous with *Buplex.* His genotype, *Pangonia angusta* Macquart, 1847, is an Australian species which, according to Ferguson (1926, Bull. Ent. Res., XVI, 4, p. 303) belongs to *Ectenopsis* Macquart.

In *Corizoneura albifacies* Ricardo, of South Africa, which Austen includes in *Buplex,* the frons of the male is quite wide, the eyes being broadly separated. As I have seen no other males of African species of *Buplex,* I am unable to state whether or not this peculiarity holds throughout the genus.

Buplex is here restricted to the species with ocelli and would then contain the following Ethiopian forms: *Corizoneura albifacies* Ricardo (1914), *Tabanus barbatus* Linnaeus (1764) (= *Pangonia alternans* Macquart, 1855), *Pangonia fasciata* Macquart (1834), *Buplex fuscinervis* Austen (1920), *Pangonia leucomelas* Wiedemann (1828), and *Pangonia suavis* Loew (1858). Enderlein lists *Corizoneura albifacies* and *Pangonia leucomelas* under *Ommatiosteres,* but specimens before me have distinct ocelli. Moreover, Wiedemann included his *P. leucomelas* in the group with ocelli.

In the Ethiopian Region, *Buplex* appears to be exclusively South African. No species has been found in the Belgian Congo. It is possible, however, that the genus occurs outside Africa.

Ommatiosteres Enderlein

Ommatiosteres Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 336; 1925, *loc. cit.,* XI, 2, p. 267. Type by original designation: *Pangonia bifasciata* Wiedemann, 1821.

Ommatiosteres differs from *Buplex* merely in the absence of ocelli and I am by no means convinced that this peculiarity is of sufficient value in this group to warrant its use as a generic difference in the absence of other characters.

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[1] Others are more properly placed in *Phara* Walker (= *Cadicera* Macquart) or in *Metaphara* Enderlein.

There are some curious contradictory statements in the literature concerning the genotype, *Pangonia bifasciata.* Miss Ricardo in 1900 (Ann. Mag. Nat. Hist., (7) V, pp. 105 and 108) wrote that the male in the British Museum "has a prolongation on the second joint of the fore tarsi, reaching to the end of the third joint, with long hairs on its apex." In a later paper (1914, Ann. South Afr. Mus., X, p. 448), she describes the male as having "no prolongation on the second joint of the tarsi." Enderlein says that in *Ommatiosteres* the two basal segments of the fore tarsi are normal in the male.

Ommatiosteres appears to be strictly Ethiopian and contains the following species: *Pangonia bifasciata* Wiedemann (1821), *Pangonia brunnipennis* Loew (1858), *Pangonia bukamensis* J. Bequaert (1913), *Ommatiosteres caffrica* Enderlein (1925), *Corizoneura dissimilis* Ricardo (1914), *Pangonia fuscanipennis* Macquart (1855), *Pangonia spiloptera* Wiedemann (1821), *Pangonia subfascia* Walker (1854), and *Pangonia sulcifrons* Macquart (1855). Of the other species included by Enderlein, *Corizoneura albifacies* Ricardo (1914) and *Pangonia leucomelas* Wiedemann (1828) have ocelli and consequently belong in *Buplex; Pangonia flavipes* Macquart (1838) is described as having the first posterior cell closed and should be placed in *Metaphara; Pangonia lateralis* Fabricius (1805), has the face distinctly snout-like (as recognized by Austen and shown by a male before me) and is a *Nuceria; Cadicera flavicoma* Austen (1912), *Corizoneura obscura* Ricardo (1908), and *Cadicera speciosa* Austen (1912) appear to belong more properly in *Phara* (where they were placed by Austen) and form perhaps the transition between that genus and *Ommatiosteres.*

Ommatiosteres bukamensis (J. Bequaert)

Pangonia bukamensis J. Bequaert, 1913, Rev. Zool. Afric., III, 3, p. 227 (♀; between Bukama and Sankisia, Katanga).

This species is known only from the type.

Female. — Black, with white apical margins on the first five or six abdominal segments dorsally and ventrally; the bands slightly broadened medially on tergites two, three, and four. Legs pale brownish-red. Antennae brownish-red at the base, the third segment almost entirely black. Wings clear, with yellow veins and stigma, and tinged with yellow along the costal margin and in the basal half. Length, 12 mm.

Male unknown.

Enderlein (1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 365) includes this species in his genus *Siridorhina* (which is identical with *Nuceria* Walker), but this must have been due to an oversight. The description states plainly that the face is not swollen into a snout, but at most slightly convex in the middle, and without shiny callosities. The proboscis is about as long as head and thorax together. There are no ocelli and the eyes are bare. Both first and fourth posterior cells are broadly open at the margin.

Nuceria Walker

Nuceria Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 7. Type by designation of Coquillett (1910): *Pangonia longirostris* Hardwicke, 1823. Not *Nuceria* Enderlein, 1922, which equals *Philoliche* Wiedemann.

Corizoneura Rondani, 1863, Archiv. Zool. Anat. Fisiol. Canestrini, III, p. 85. Type by designation of Coquillett (1910): *Pangonia appendiculata* Macquart, 1838 = *Tabanus aethiopicus* Thunberg, 1789. Austen, 1920, Bull. Ent. Res., XI, p. 139. Not *Corizoneura* Enderlein, 1922.

Couzoneura D. Sharp, 1916, 'Zool. Record for 1914,' Insecta, p. 282. Misspelling of *Corizoneura*.

Siridorhina Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 3, p. 336; 1925, *loc. cit.*, XI, 2, p. 265. Type by original designation: *Pangonia longirostris* Hardwicke, 1823.

If one accepts Coquillett's selections of genotypes as valid, *Siridorhina* is a plain synonym of *Nuceria*. Moreover, the genotype of *Corizoneura* is evidently congeneric with that of *Nuceria*. The genus, as here accepted, has been correctly defined by Austen (1920).

Nuceria contains a fairly large number of species in the Ethiopian and Oriental Regions. Five species have thus far been found in the Belgian Congo, separated as shown in the subjoined key:

1. Female: Abdomen bicolored, the two basal segments pale straw-colored, the remainder chestnut-brown with black pilosity; no pale fringes of hair on the tergites. Legs entirely russet yellow. Dorsum of thorax thickly covered with short, bright yellow hairs, the pollinosity forming faint longitudinal stripes; pleura and sternum with black pile. Length, 18 to 20.5 mm.; of proboscis, 18 to 24 mm. Male unknown. .... *N. mayombensis.*

Abdomen not bicolored as indicated above, either uniformly russet or with black markings; often with fringes of pale hair at the apices of some of the tergites.......... 2.

2. Female: abdomen russet dorsally and ventrally, without dark markings; dorsum of thorax sepia-colored, unstriped, with a ridge of longer yellow hair above the base of the wing; legs cinnamon-rufous. Male: abdomen russet; the fifth and sixth tergites brownish black; the first to fourth often with a median, anterior, small, brownish black spot; fore tarsi with processes at tips of first and second segments projecting beyond the end of the following segment. Length, 17 to 18 mm. *N. inornata.*

Abdomen conspicuously marked with black in both sexes. The black markings in the male more extensive, or the dorsum of the thorax is conspicuously striped, or the legs are not entirely rufous, or the fore tarsi have much shorter or no processes... 2.

2. Both sexes: dorsum of thorax yellow pollinose, with three conspicuous black-brown longitudinal stripes; abdomen ochre-yellow, with a row of median, dorsal, black spots; the fifth and sixth segments almost wholly black in the male; legs ochraceous-rufous; a tuft of black hair before the base of the wings. Length, 17 to 20 mm.......*N. virgata.*

Dorsum of thorax without conspicuous longitudinal stripes.......................... 3.

3. Female and male colored much alike; dusky, with the two basal segments of abdomen conspicuously paler, ochraceous, especially on the ventral side; the second tergite in the male with a median, brown blotch; second and fourth tergites with a fringe of silvery-white hair on the hind margin; fore and middle legs russet-brown, their tibiae and tarsi somewhat paler; hind legs blackish brown; first and second segments of fore tarsi in the male with moderate processes which do not reach the distal end of the following segment. Length, 16 to 18.5 mm....................... *N. schwetzi.*

Female and male conspicuously different in color, the venter not bicolored. Male: abdomen tawny, with a black, median spot on tergites one to four, the remainder mostly black; thorax sepia-colored with narrow, blackish, longitudinal streaks. Female: dorsum of thorax and first abdominal segment clay-brown, the thorax with a brighter, median, longitudinal stripe; second and following segments clove-brown, clothed on the hind margins with short, whitish hair; legs clove-brown. Male without processes at the tips of the fore tarsal segments. Length, 18 to 19 mm. *N. neavei.*

Nuceria mayombensis J. Bequaert

Nuceria mayombensis J. Bequaert, 1924, Rev. Zool. Afric., XII, 4, p. 464 (♀; Ganda Sundi, Belgian Congo).

Siridorhina ziemanni Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 266 (♀; Johann Albrechtshöhe and Lolodorf, Cameroon; Nkolentangan, Spanish Guinea).

A careful comparison of the types of *N. mayombensis* with the description of *S. ziemanni* leaves no doubt that Enderlein redescribed the species which I named from the Mayombe. It is one of the very few "*Pangoniae*" of the West African rain forest, where it is known only from the coastal area of Lower Guinea in Cameroon, Spanish Guinea and the Mayombe District of the Belgian Congo.

Nuceria inornata (Austen)

Diatomineura inornata Austen, 1911, Bull. Ent. Res., I, p. 282 (♀; between Bunkeya and Kambove, Katanga).
Corizoneura inornata Austen, 1920, Bull. Ent. Res., XI, pp. 140 and 146 (♀ ♂).
Pangonia neavei J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 224 (♀ ♂). Not *Diatomineura neavei* Austen.
Pangonia zonata J. Schwetz, 1919, Rev. Zool. Afric., VII, pp. 46–54 and 92–106; 1919, Ann. Trop. Med. Paras., XII, pp. 281–288. Not *Pangonia zonata* Walker.

This species is common at the proper season (April to June) in many parts of Katanga, extending northward as far as Kisengwa and between Kabalo and Kongolo. Both sexes visit flowers, but the females also bite and suck blood. According to Schwetz's observations, they frequent the flowers of certain Acanthaceae, especially of *Acanthus montanus* (Nees).

Nuceria virgata (Austen)

Diatomineura virgata Austen, 1911, Bull. Ent. Res., I, p. 277, fig. 2 (♀ ♂; mid-Lualaba Valley, 3,000 ft., Katanga). J. Bequaert, 1924, Psyche, XXXI, p. 34.
Pangonia virgata J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 224 (♀ ♂).
Corizoneura virgata Austen, 1920, Bull. Ent. Res., XI, p. 140.

This species is known only from the Katanga District of the Belgian Congo.

Nuceria schwetzi (Austen)

Corizoneura schwetzi Austen, 1920, Bull. Ent. Res., XI, p. 143 (♀ ♂; Kakanu, Lomami District, Katanga).
Pangonia oldii J. Schwetz, 1919, Rev. Zool. Afric., VI, pp. 46–54 and 92–106. Not *Pangonia oldii* Austen.

This species is known from the Katanga and Tanganyika Territory. It flies about the same time as *N. inornata*. J. Schwetz found both sexes visiting the flowers of the Acanthaceae, *Mellera lobulata* S. Moore and *Whitfieldia subviridis* Clarke. The females also bite and suck blood.

Nuceria neavei (Austen)

Diatomineura neavei Austen, 1911, Bull. Ent. Res., I, p. 279 (♀ ♂; Kambove, Katanga).
Corizoneura neavei Austen, 1920, Bull. Ent. Res., XI, p. 140.
Pangonia austeni J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 225 (in part: ♀; not ♂).

This species is known only from the Katanga District of the Belgian Congo, where it is locally common at the beginning of the dry season. The females bite and suck blood.

Tribe Chrysopini

Chrysops Meigen

Chrysops Meigen, 1803, Illiger's Mag. f. Insectenk., II, p. 267. Monotypic for *Tabanus caecutiens* Linnaeus, 1758 (*Chrysops* Meigen, 1800, 'Nouvelle Classification des Mouches,' p. 23, is without standing in nomenclature, since no species is mentioned).

Chrysopsis Duméril, 1823, 'Considér. Génér. Classif. Insectes,' p. 227.

Heterochrysops Kröber, 1920, Zool. Jahrb., Abt. Syst., XLIII, 1–4, pp. 50 and 55. Type by designation of Enderlein (1925): *Chrysops mlokosiewiczi* Bigot, 1880.

Neochrysops Szilády, 1922, Ann. Mus. Nat. Hungarici, XIX, p. 126. Type by original designation: *Neochrysops grandis* Szilády, 1922. Not *Neochrysops* Walton, 1918.

Psylochrysops Szilády, 1926, Zoolog. Anzeiger, LXVI, p. 328. New name for *Neochrysops* Szilády, 1922.

Ziemannia Enderlein, 1923, Deutsche Ent. Zeitschr., p. 544; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 324. Monotypic for *Chrysops laniger* Loew, 1860.

Kleineana Enderlein, 1923, Deutsche Ent. Zeitschr., p. 544; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 324. Type by original designation: *Chrysops longicornis* Macquart, 1838.

Nemorius Rondani, 1856, 'Prodrom. Dipt. Ital.,' I, p. 171. Monotypic for *Chrysops vitripennis* Meigen, 1820.

Haemophila Kriechbaumer, 1873, Verh. Zool. Bot. Ges. Wien, XXIII, p. 70. Monotypic for *Haemophila fallottii* Kriechbaumer, 1873 = *Chrysops vitripennis* Meigen, 1820.

Haematophila Verrall, 1882, in Scudder, 'Nomenclator Zoologicus,' I, p. 152. Emendation of *Haemophila* Kriechbaumer, 1873.

Turanochrysops Stackelberg, 1926, Bull. Ent. Res., XVI, 4, p. 326 (as a subgenus of *Chrysops*). Monotypic for *Chrysops hyalipennis* Stackelberg, 1926.

Neochrysops Walton, 1918, Proc. Ent. Soc. Washington, XX, p. 191. Monotypic for *Neochrysops globosus* Walton, 1918.

Of the many names proposed for certain more or less apparent groups of species in *Chrysops*, only two or three appear to be worthy of recognition even as subgenera.

Heterochrysops Kröber I cannot accept as a valid subgenus. It was proposed for the species in which the dark cross-band of the wing has a well-defined hyaline spot, or "fenestra," in the discal cell. This peculiarity occurs in certain forms which are not otherwise related, such as *Chrysops variegata* (de Geer) (= *C. costata* Fabricius) and *C. fulvaster* Osten Sacken. In some Ethiopian species, such as *C. brucei* Austen, the center of the discal cell is more or less bleached, without, however, forming a distinct fenestra.

Neochrysops Szilády (= *Psylochrysops* Szilády) was defined as follows: "Differs from *Chrysops* by: (1) abdomen not tomented; (2) tibiae all spindle-shaped, long, cylindrical; (3) antennae almost as long as head and thorax together, basal joints stick-shaped, long, cylindrical; (4) dorsum of thorax provided, before the scutellum, with a light-colored hair-wreath." Species with this combination of characters are found in the Oriental and Ethiopian Regions only and seem to form a fairly natural group, perhaps of subgeneric rank. Since, however, the group includes *Chrysops longicornis*, the genotype of *Kleineana* Enderlein, it should be known under that name which antedates *Psylochrysops*.

Ziemannia Enderlein was based entirely upon the shape of the eye in the male, the facets being all about of equal size and the eyes touching each other in one point beneath the anterior ocellus. This peculiarity is not, in my opinion, of more than specific value.[1] Kröber (1927, Zool. Jahrb., Abt. Syst., LIII, pp. 182 and 197) has attempted to characterize this group by the relative length of the branches and basal stalk of the third longitudinal vein. He writes that in *C. laniger*, the genotype of *Ziemannia*, the basal stalk is hardly longer than the discal cell and only about two-thirds of the length of the branches. In the series of *C. laniger* before me the difference in length, although quite distinct, is not as pronounced as described and figured by Kröber: the lower branch is hardly longer than the stem-vein, but the upper branch is distinctly so. This character is altogether too trifling to be of more than specific value.

Kleineana Enderlein was likewise based upon the eyes of the male, which are described as rather broadly separated by the frons, the facets being all of about equal size. This character is hardly more than specific and is found in such totally unrelated species as *Chrysops longicornis* Macquart and *Chrysops brucei* Austen. On the other hand, *Chrysops dispar* (Fabricius), which I regard as nearly allied to *Chrysops longicornis*, has the eyes of the male completely holoptic, with very unequal facets. Nevertheless, since the genotype, *C. longicornis*, possesses all the characters of *Neochrysops* Szilády, the name *Kleineana* may be retained in a subgeneric sense for that group, as indicated above.[2]

Nemorius Rondani and *Turanochrysops* are based solely upon the absence of dark markings in the wings, a character which in itself is unimportant. In certain North American species, such as *C. nigribimbo* Whitney, the dark markings show a distinct tendency to fade out.[3] The absence of facial calli in *Nemorius* is likewise of not more than specific value, since they are lacking in several typical species of *Chrysops*, such as *C. laniger* Loew. *Haemophila* Kriechbaumer and *Haematophila* Verrall are synonyms of *Nemorius*, having the same genotype.

Neochrysops Walton, based upon a North American species, is very doubtfully valid as a subgenus, the characters on which it was based being, taken individually, hardly more than specific. Only one specimen is known. I suggest that the peculiarly inflated abdomen was abnormal, perhaps due to infestation with a parasitic worm (*Mermis*). The very long appendix to the fork of the third longitudinal vein is the most unusual feature of *Neochrysops*.

Nemorius and *Neochrysops* not being represented in the Ethiopian Region, the thirty-five described species from that area (including four from Madagascar) may be arranged into two groups as follows:

1. Subgenus *Chrysops*, proper. — Antennae of moderate length, at most as long as the dorsum of the thorax, the first segment often thicker than the second. Fore tibiae rarely swollen. More thickset species. (Syn.: *Ziemannia* Enderlein

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[1] Kröber's statement that *C. funebris* Austen and *C. distinctipennis* Austen would also belong in *Ziemannia*, owing to the structure of the eyes in the males, is incorrect. The males of these two species have the eyes distinctly separated by the frons, exactly as in their near relatives, *C. longicornis* Macquart and *C. stigmaticalis* Loew.

[2] I cannot understand Enderlein's statement that the broadly separated eyes of the male isolate *Kleineana* entirely among the Tabanidae. There are several other cases of completely separated eyes in that sex in this family.

[3] *Chrysops hyalinus* Shannon (= *C. vitripennis* Shannon; *C. claripennis* Kröber), of North America, shows absolutely no relationship with *C. vitripennis* Meigen. After an examination of the type, I am inclined to believe that it may have been based upon an abnormal specimen of *C. nigribimbo*, in which the wings were accidentally wholly clear.

and *Heterochrysops* Kröber). The following Ethiopian species belong here: *C. aprugna* Austen, *C. austeni* Neave, *C. bicolor* Cordier, *C. brucei* Austen, *C. calida* Walker, *C. ciliaris* Loew, *C. confluens* Loew (?), *C. fuscipennis* Ricardo, *C. griseicollis* J. Bequaert, *C. inconspicua* Austen, *C. inflaticornis* Austen, *C. insulensis* Austen, *C. laniger* Loew, *C. laticeps* Austen, *C. lloydi* Austen, *C. madagascarensis* Ricardo, *C. magnifica* Austen (and var. *inornata* Austen), *C. maxima* Kröber, *C. natalis* Macquart, *C. neavei* Austen, *C. obliquefasciata* Macquart, *C. pallidula* Austen, *C. pusillula* Austen (?), *C. streptobalia* Speiser, and *C. woodi* Neave.

2. Subgenus *Kleineana* Enderlein. — Antennae very long and slender, at least as long as the thorax (including the scutellum), the first segment usually thinner than the second. Fore tibiae more or less swollen. Rather elongate species. Type: *Chrysops longicornis* Macquart, 1838. (Syn.: *Neochrysops* Szilády = *Psylochrysops* Szilády). The "wreath" of light pile in front of the scutellum may be present or absent. This group comprises in the Ethiopian Region: *C. bimaculosa* Neave, *C. centurionis* Austen, *C. dimidiata* van der Wulp, *C. distinctipennis* Austen, *C. funebris* Austen, *C. langi* J. Bequaert, *C. longicornis* Macquart, *C. nigrobasalis* Kröber, *C. silacea* Austen, and *C. stigmaticalis* Loew.

Habits of *Chrysops*. — In view of the medical significance assumed by some of the species, a few notes on the habits of these flies may be of interest. In my own experience I have never found them in Africa to be as numerous and as troublesome as in certain regions of North America. There are parts of Africa, however, where they are more abundant than elsewhere and a great nuisance. A. and S. L. M. Connal state that in the central and eastern areas of Southern Nigeria, which comprise innumerable creeks and many square miles of forest swamp, *Chrysops dimidiata* and *C. silacea* are a veritable pest.[1] They describe the behavior of either of these two species as follows: "It makes no sound as it hovers near, and, while not so furtive and so quick as the tse-tse, it is equally persistent. Like the anopheline, it generally alights on those parts which are not usually in full view, such as the ankles, the back of the legs and the outer side of the hands. The bite itself is not painful at the time, indeed it is seldom noticed, but the act of withdrawing the biting parts is usually appreciated. In most cases there is considerable irritation, and often extensive swelling a few minutes to a few hours after the bite, and the swelling may persist for days. From sunrise until 10 or 11 A.M., and from 4 P.M. until dusk are the periods when the fly is most numerous and attentive. When it is disturbed it returns again and again. It seldom attacks in bright sunlight, preferring the shade of the trees or the shelter of the verandah. Only thirty to forty per cent of the flies will feed on the day of capture, but if kept for a day or two many more will feed. The hungry fly, without loss of time, spreads out the legs, projects the palps forwards and outwards, these last showing a fine tremor, and the biting parts are inserted deliberately and neatly. As a rule, the blood-sucking apparatus is not withdrawn until the insect has had its fill. At times, however, after thrusting in

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[1] 1922, Trans. Roy. Soc. Trop. Med. Hyg., London, XVI, pp. 86–88.

more and more deeply until the projecting palps rest on the skin, and after one or two sawing movements, the biting parts are extracted and re-inserted at another site. Once a satisfactory source of blood is secured, the feeding goes on uninterruptedly until the insect is replete. . . . In Experiment twenty-three, at Calabar, six flies were weighed immediately before and immediately after feeding. The increase of weight was respectively 0.059 gramme, 0.045 gramme, 0.03 gramme, 0.03 gramme, 0.03 gramme, and 0.03 gramme. The pose in feeding is characteristic. The fly becomes rigid and tense, the wings are slightly extended, and the tip of the abdomen is tilted upwards. Shortly after the current of blood has begun to enter the gut, occasional spasmodic contractions of the abdominal segments take place, followed by the act of defecation. Gradually, as the abdomen distends, it begins to drop until finally it drags, and there may even be a droplet of fresh blood exuding from the posterior extremity. Once blood has been tasted by a willing fly, it may be forced to withdraw the biting parts, but on release it will immediately re-insert them. When the biting parts are fully inserted, the labium is rucked up in folds like a loose stocking, with the labella flattened out on the skin. . . . The rate of sucking the blood varied considerably, sometimes five minutes or longer elapsing before the individual is satisfied. Even although it may be barely able to crawl, it is always able, though in a heavy fashion, to wing its way to the side of the cage. Various preferences are shown by *Chrysops*. They will more readily bite Africans than Europeans. They are also more ready to bite on a black area of a guinea-pig's skin than on a white area. It was found, also, that they fed more readily on some of the black boys than on others."

In experiments with several hundreds of *C. silacea* and *C. dimidiata*, only one fly laid eggs in captivity, although at the time (during June and July) female flies were present in very large numbers and for the most part carried undeveloped eggs. In the one case observed, the eggs "were deposited on a moist dead leaf lying on the surface of some swamp mud which had been placed in a tin at the bottom of the cage. These eggs were grayish white at first, latterly turning brown along their length and black at the tips. They were laid in a single layer, all upright, in an irregular mass, and they numbered about a hundred. After four days they had all hatched, and the young larvae had disappeared into the mud. A week later an attempt was made to recover them, but no trace could be found. Whether their cannibalistic tendencies accounted for this disappearance, or whether the swamp mud is an unsuitable medium must be left an open question. Neither the ova nor the larvae differed in any way from those described for other species of *Chrysops*." The Connals also found in the moisture gathered by the bases of the leaves of the "screw-pine" (*Pandanus*), which abounds on the river banks, very young larvae identical with those that hatched from the batch of eggs laid in captivity by a *Chrysops* as described above. Similar small larvae were also found in the cup of a small purple flower which grew in great profusion on the swampy river bank.

Medical importance of *Chrysops*. — The only African human disease positively known to be carried by tabanids is caused by a nematode worm, *Loa loa*

(Guyot). The adult of this parasite lives preferably in the subcutaneous tissues of man, producing the so-called Calabar swellings. The embryos, originally described as *Microfilaria diurna*, swim in the blood. Manson, in 1895, suggested that they might be carried by *Chrysops dimidiata* v. d. Wulp; but Leiper, in Nigeria, was the first to carry out experiments. Of several biting insects which Leiper tried, *Chrysops dimidiata* and *C. silacea* were the only ones in which he observed a rapid and uniform development of the embryos after feeding the flies upon an infected patient. In *Haematopota cordigera* and *Hippocentrum trimaculatum* a slight degree of infection was obtained, but development was unequal and slow.[1] Kleine, in Cameroon, found 5.3 per cent of wild *Chrysops silacea* and *C. dimidiata* infected with larvae of a *Filaria*, which he believed to belong to *Loa loa*, without proving it by experiment.[2]

The entire life-cycle of *Loa loa* was completely and brilliantly elucidated by Dr. A. and Mrs. S. L. M. Connal, in Nigeria.[3] In dissecting 2,283 wild specimens of *Chrysops silacea* (2,031) and *C. dimidiata* (252), these investigators found twenty-two flies (16 *C. silacea*, or 0.8 per cent; 6 *C. dimidiata*, or 2.4 per cent; total percentage, 0.96) infected with filariae. They later succeeded in infecting wild flies of these two species with embryos of *Loa loa* from man and in transmitting the parasite with these flies to guinea pigs, rabbits and a monkey. The flies become infective in from ten to twelve days after ingesting the embryos. It is of interest to note that *Chrysops* is a strictly diurnal biter, while the larvae of *Loa loa* are, as a rule, found in the peripheral circulation of man during the day only.[4]

KEY TO THE SPECIES OF *CHRYSOPS* OF THE BELGIAN CONGO

1. Apical half of the wing more or less uniformly infuscated, although with paler or more yellowish areas or very gradually fading toward the hind-margin; the median dark band not sharply divided by a hyaline streak or triangle from the apical spot.... 2.

Median dark cross-band of wing sharply divided by a hyaline streak or triangle from the apical spot.......... 5.

2. Antennae moderately elongate, slightly shorter than the dorsum of the thorax; first segment swollen, thicker than the second; second about half as long as the third; basal division of third segment with a sharply constricted basal portion and the remainder superficially divided into annuli. Fore tibiae slender. Head and thorax

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[1] Leiper, R. T. 1913. '*Filaria loa.*' Brit. Med. Jl., I, pp. 39–40.

1913. 'Report of the helminthologist, London School of Tropical Medicine, for the half-year ending April 30th, 1913.' Report to the Advisory Committee of the Tropical Diseases Research Fund. (Abstract in Tropical Dis. Bull., II, 1913, pp. 195–196).

[2] Kleine, F. K. 1915. 'Die Uebertragung von Filarien durch *Chrysops*.' Zeitschr. Hyg. Infektionskr., LXXX, pp. 345–349.

[3] Connal, A. 1921. 'Observations on *Filaria* in *Chrysops* from West Africa.' Trans. R. Soc. Trop. Med. Hyg., XIV, 6, pp. 108–109.

Connal, A. and Connal, S. L. M. 1921. 'A preliminary note on the development of *Loa loa* (Guyot) in *Chrysops silacea* (Austen).' *loc. cit.*, XV, pp. 131–134.

1922. 'The development of *Loa loa* (Guyot) in *Chrysops silacea* (Austen) and in *Chrysops dimidiata* (van der Wulp).' *loc. cit.*, XVI, pp. 64–89, 5 Pls. (Correction in 1923, *loc. cit.*, XVI, 7, p. 437).

[4] Ringenbach and Guyomarc'h (1914, Bull. Soc. Path. Exot., Paris, VII, p. 623), in the French Congo, found in the stomach of *Chrysops centurionis* Austen embryos of filariae which they refer to *Loa loa* and *Acanthocheilonema perstans*, but they were unable to confirm these identifications by experiments. *Chrysops longicornis* has also been included in some of the compilations of the intermediate hosts of helminths; but I have been unable to trace original observations or experiments dealing with this insect and *Loa loa*.

black, partly covered with yellow pollinosity which forms two distinct longitudinal stripes over the middle of the dorsum. Ocellar and basal calli of the frons distinct, shiny, black; facial callosities pale brown, darker on the sides. Antennae, legs, and abdomen mostly orange-rufous; the abdomen above with two dark brown to black longitudinal stripes beginning on the first tergite and extending to the third or fourth. Infuscation of apical half of wing gradually fading from the discal cell to the hind margin. Length, 7 to 9 mm.. *C. neavei.*

Antennae very long and slender, at least as long as the dorsum of the thorax plus the scutellum; first segment thinner than the second. Fore tibiae swollen. Ocellar callus not raised, not shiny.. 3.

3. Apical half of the wing fairly uniformly infuscated from the tips of the basal cells on; a lighter streak in the first submarginal cell (between the stigma and the fork of the third vein) and in the fifth posterior cell. Abdomen dorsally mostly blackish-brown, with a broad median, and narrower lateral, pale yellowish stripes over the second to fourth tergites, the first tergite with dark apical margin, narrowed in the middle; ventrally mostly pale yellowish, with a median blackish stripe which widens posteriorly. Legs, palpi, and basal segments of antennae reddish yellow. Length, 11 to 12.5 mm.. *C. langi.*

Infuscated apical half of the wing distinctly darker at the apices of the basal cells and the base of the discal cell, beyond which it is more or less tinged with yellow. Brownish black dorsal stripes of the abdomen narrower and shorter; the hind margin of the first tergite not broadly blackish. Smaller, 8.5 to 11 mm...................... 4.

4. Blackish dorsal abdominal stripes rather wide and straight, more or less connected with the brown or blackish hind segments; venter with a more or less distinct brownish black, median stripe which widens posteriorly. Dark apical half of wing but faintly yellowish across the discal cell.................................... *C. dimidiata.*

Blackish dorsal abdominal stripe short and narrow, rarely reaching beyond the base of the third tergite, often faint or reduced to indistinct spots; venter almost entirely reddish yellow. Dark apical half of wing with a distinctly paler and strongly yellowish area extending from the stigma to the base of the fourth posterior cell..........*C. silacea.*

5. Antennae short, at most as long as the thorax; the first segment more or less swollen and thicker than the second when seen from above; the second shorter than the first. Body short, thickset. Face not snout-like.................................... 6.

Antennae slender and elongate, longer than the thorax; the first segment slender, not thicker than the second which is at least as long as the first. Body more or less elongate. Face snout-like.. 8.

6. Female: Frons about twice as wide as long, with a large, halfmoon-shaped, shiny black basal callus and two smaller, shiny black calli on the vertex (on either side of the ocelli). Face uniformly pollinose without callosities. Head, antennae, thorax, and legs brownish black to black; dorsum of thorax not striped; abdomen tawny red. First antennal segment strongly swollen, about one and one-half times the length of the second. Median cross-band of wing reaching the hind margin; the apical spot narrow and of uniform width, very narrowly connected with the median band along the costa; upper branch of the third longitudinal vein longer than the basal stalk. Male: similar in color, but densely covered with long, snow-white hairs; eyes barely touching each other in one spot beneath the ocelli. Length, 7 to 8 mm.... *C. laniger.*

Frons of female much narrower, hardly wider than long; no shiny calli on the sides of the vertex. Abdomen mostly black. First segment of antennae slightly swollen. Upper branch of third longitudinal vein shorter than the basal stalk.................... 7.

7. Female: Mostly black; first antennal segment, palpi, legs, apex of scutellum, and small spots on the sides of the first two abdominal tergites, tawny reddish. Face with two narrow, pale, shiny, median callosities converging toward the mouth and with a small, shiny black spot on each side close to the lower edge of the eye. Dorsum of thorax with distinct, continuous, longitudinal stripes of pale pollinosity; abdominal tergites with grayish pollinose hind margins which widen on the middle line into small triangles. Second antennal segment but little shorter than the first. Median cross-band of wing not reaching the hind margin, its outer border wavy; the apical spot irregularly divided. Male: On the whole darker than the female, without stripes on

the thorax; tergites of the abdomen extensively reddish brown on the sides; basal cells partly infuscated; frons much narrower than in the female, but the eyes still broadly separated beneath the ocelli. Length, 7.5 to 9.5 mm. . . . . *C. brucei.*

Female: Mostly black, with nearly the basal half of the second abdominal tergite and the base of the venter pale yellowish; most of the tergites with gray hind margins. Face uniformly gray, without shiny callosities. Dorsum of thorax without distinct stripes. Second antennal segment only half as long as the first. Median cross-band of wing broad and quite regular, reaching the hind margin. Length, 9 mm. Male unknown. . . . . *C. griseicollis.*

8. Face forming a very prominent snout, in profile at least as long as the small diameter of the eye, generally longer. Tibiae not conspicuously swollen. Antennae moderately slender. Fourth and fifth posterior cells each with a hyaline spot. . . . . 9.

Snout-like face less prominent in profile, shorter than the small diameter of the eye. Tibiae conspicuously swollen. Antennae very slender. Fourth and fifth posterior cells without a hyaline spot. . . . . 10.

9. Costal border of the wing pale brownish yellow, the same color as the stigma. Black with the legs mostly pale reddish yellow; the coxae and knees black; abdomen extensively covered with grayish white pollinosity, leaving dorsally median, velvety black spots; the hind margins of the tergites more silvery gray. Facial shiny callosities very large, but divided by a triangle of gray pollinosity. In the male the wings are more extensively infuscate than in the female. Length, 8 to 10 mm. . . . . *C. distinctipennis.*

Costal border of wing nearly black, much the same color as the median cross-band; stigma yellowish. General color as in the foregoing. Length, 8 to 9 mm. *C. stigmaticalis.*

10. Second tergite of abdomen always more or less extensively pale straw-yellow on the sides; first and second sternites also straw-yellow; remainder of the abdomen varying from entirely black to mostly reddish yellow, with a black spot on the second tergite. Legs blackish brown to black; femora more or less reddish yellow; basal segments of middle and hind tarsi yellowish white. Thorax with golden yellow hairs on the humeral calli, on an oblique band of the mesopleuron in front of the base of the wing (extending dorsally to the transverse suture), on the metapleura, and on a complete cross-band in front of the scutellum. Length, 7 to 9.5 mm. Male similar to the female, but the legs are darker, the basal cells are partly infuscated and the eyes are separated by a narrow frons. . . . . *C. longicornis.*

Abdomen entirely black, both dorsally and ventrally; sides of second tergite obscurely gray pollinose, rarely somewhat translucent. Golden yellow pile of the thorax restricted to the humeral calli, the oblique bands in front of the wings, and the metapleura. Otherwise as in *C. longicornis.* Length, 8.5 to 11 mm. . . . . *C. funebris.*

Chrysops laniger Loew

Chrysops laniger Loew, 1860, 'Dipteren-Fauna Südafrikas,' I, p. 28 (♀♂; Cape Colony).

Ziemannia laniger Enderlein, 1923, Deutsche Ent. Zeitschr., p. 544. Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 179, 183 and 198, figs. 1–3; Pl. II, figs. 1 and 2; Pl. V, fig. 1, Pl. VI, fig. 1 (♀♂).

Chrysops wellmanii Austen, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 512 (♀; Chiyaka District, Angola). Neave, 1915, Bull. Ent. Res., V, p. 299, fig. 8*a-b*, Pl. XXVII, fig. 3 (♀♂; larva and pupa).

Chrysops cana Austen, 1911, Bull. Ent. Res., II, p. 166 (♂; Mosangaleni, 3,000 ft., Kenya Colony). Neave, 1912, *loc. cit.*, III, pp. 286 and 313 (♀♂).

Chrysops muscoreus "Schiner" Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, p. 198 (as a synonym of *Ziemannia laniger* Loew).

Belgian Congo. — Elisabethville, several females, from August to October (Mich. Bequaert and Ch. Seydel).

Northern Rhodesia. — Kafue River, one female, October 1923 (Mich. Bequaert).

This interesting *Chrysops* appears to be restricted to the East-and-South

African Subregion, where it has been positively recorded from Cape Colony, Angola, the Katanga, Northern Rhodesia, Nyasaland, and Kenya Colony. Kröber includes "Uganda" in the distribution, but I suspect that the specimens which he saw were labelled "Uganda Railway," which, of course, is in Kenya Colony.

Chrysops brucei Austen

Chrysops brucei Austen, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 513 (♀; Kiadondo, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 50, Pl. III, fig. 17 (♀). Neave, 1912, Bull. Ent. Res., III, pp. 286 and 322, Pl. XI, fig. 9 (♀♂). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 178, 186, and 246; Pl. IV, fig. 31; Pl. V, fig. 19 (♀♂).

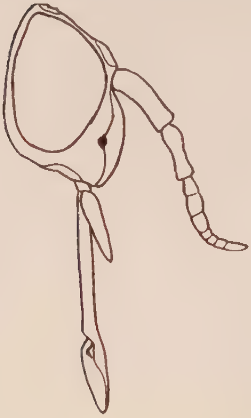
Chrysops siccus Becker, 1922, Denkschr. Ak. Wiss. Wien, Math. Naturw. Kl., XCIII, p. 65 (♂; Khor Lolle near Tonga, Anglo-Egyptian Sudan).

BELGIAN CONGO. — Kabare, one female and two males taken in the girdle of reeds (*Phragmites*) at the southern shore of Lake Edward, August 27, 1914. The eye markings in life of both sexes, drawn from these specimens, are shown in Text Fig. No. 8*a* and 8*b*.

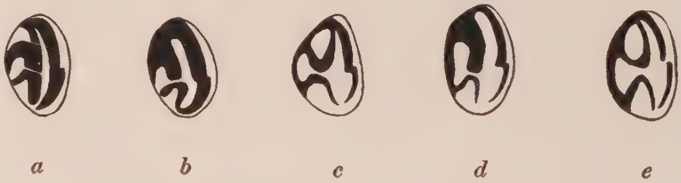
This species is common in Uganda and in the Anglo-Egyptian Sudan.

Chrysops neavei Austen

Chrysops neavei Austen, 1911, Bull. Ent. Res., I, p. 275, fig. 1 (♀; Kundelungu Plateau, 5,000 to 6,000 ft., Katanga). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 221 (♀). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 181, 185, and 213, Pl. III, fig. 17; Pl. V, figs. 11 and 12 (♀).



TEXT FIGURE 7. — Head and antenna in profile of *Chrysops neavei* Austen, female



TEXT FIGURE 8. — Markings of the eyes of African *Chrysops* in life: *a*, *C. brucei* Austen, female; *b*, *C. brucei*, male; *c*, *C. longicornis* Macquart, female; *d*, *C. longicornis*, male; *e*, *C. funebris* Austen, female. The bright green areas are marked in black, the dark purplish areas in white

This species is known only from the Kundelungu and Biano Plateaux of Katanga. One of the females obtained by Dr. Pons in the Biano is before me.

I am figuring the head in profile (Text Fig. No. 7) since the antennae of this species have never been properly described. The third segment was missing in Austen's type; nor has it been described by Kröber. The text figure 5 (on p. 214) of Kröber's recent revision does not represent the head of *C. neavei*, but seems to be that of *C. austeni* Neave. Moreover, *C. neavei* appears to be related to *C. austeni* and *C. woodi* Neave, although readily distinguished from either by the markings of the wings and the much shorter second antennal segment. These three species, although placed by Kröber in his "*Gruppe dimidiatus*," are not in the least allied to *C. dimidiata* van der Wulp.

Chrysops griseicollis, new species

Female. — Length, 9 mm.; width of head, 2.5 mm.; width of frons at vertex, very near 1 mm.; length of wing, 8 mm.

A dark-colored species, with a uniform gray thoracic dorsum; the abdomen black, with nearly the basal half of the second tergite pale, and the posterior margin of each tergite beyond the first gray. Legs black; only the fore coxae brownish. Wings distinctly hyaline and black; extreme base, narrow costal margin to apex, and a regular cross-band reaching from stigma to posterior margin, black.

Head: frons gray; region of the ocelli at vertex not differently colored; frontal callosity shiny black, transverse, very narrowly separated from the eyes, straight on lower border, slightly biconcave above, its vertical diameter short, constricted slightly at middle. Face uniformly gray all over, without shiny callosities. Antenna entirely black; first segment nearly twice as long as the second, distinctly enlarged and shiny black; second segment shiny black, only very slightly enlarged and sparsely black hairy; third segment opaque black, only slightly shorter than first two segments together. Thorax uniformly gray pollinose, without evident stripes on the dorsum. Abdomen: first tergite dark brown; second broadly yellowish clear across anteriorly; remainder of abdomen black with the posterior margin of each tergite prominently gray; ventrally, first sternite mostly yellow, remainder black. Legs black, somewhat shiny, with the exception of the fore coxae which are brownish; all the tibiae quite slender. Wing: narrow costal margin black from base to apex, but the color distinctly narrowed before the apex of the marginal cell by the encroachment of the hyaline triangle; extreme base of wing, including the very narrow bases of the basal cells, black; median cross-band black, quite regular; posteriorly beginning near outer end of stigma at second vein and passing the third vein at its furcation, it reaches the apex of the fourth posterior cell; its anterior margin starts at the second vein directly above the base of the discal cell and, passing straight backward, reaches the posterior margin not far from the apex of the anal cell.

BELGIAN CONGO. — Stanleyville, one female, holotype, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

This species shows affinities with *C. laniger* Loew, but differs in having all the tibiae slender, the fore ones being scarcely larger than those of the other legs; also in having the cross-band of the wing of nearly uniform width from costa to posterior margin; and finally by the abdomen being mostly black instead of tawny as in the species mentioned. The uniform gray color of the thoracic dorsum, due to gray pollinosity over a dark ground and the absence of stripes, is unusual in *Chrysops*. The uniform gray face without shiny facial callosities is found in *C. laniger* also, but is not often seen in the genus *Chrysops*.

Chrysops dimidiata van der Wulp

Chrysops dimidiata van der Wulp, 1885, Notes Leyden Mus., VII, p. 34 (♀; Chinfimo near Landana, Portuguese Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 47, Pl. II, fig. 13 (♀). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 221 (♀). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 178 and 215 (♀).

BELGIAN CONGO. — Between Penge and Irumu, one female, February 27, 1914. Stanleyville, four females, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold; Medje, one female (H. Lang and J. P. Chapin).

I was at first inclined to lump *C. dimidiata* and *C. silacea* Austen; but after a more careful study of a series of specimens, I have reached the conclusion that there are probably in the rain forest of the West African Subregion several closely allied, though distinct, species of this group. Three of them are found in the Belgian Congo and may, I believe, be separated by the characters given in the key. The true *C. dimidiata* has in my opinion been correctly figured by Austen (1909). It is probably widely distributed throughout West Africa; but, as it has certainly been often confused with *C. silacea*, its distribution cannot be given correctly at present. It is to be hoped that a serious effort will be made to clear up the status of the species belonging to this group, since it contains the carriers of an important human parasite, *Loa loa* (Guyot) (see above).

Chrysops silacea Austen

Chrysops silacea Austen, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 509 (♀; Kimuenza, Belgian Congo, one of the original localities, may be designated as the type locality); 1909, 'Illustr. African Blood-Suck. Flies,' p. 48, Pl. II, fig. 15 (♀). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 221 (♀), fig. 2 (eye ♀; wrongly labelled *dimidiata*). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 181, 185, and 218, Pl. V, fig. 14 (♀).

BELGIAN CONGO. — Bafwankei (between Bomili and Avakubi), December 29, 1913. Yakuluku; Nala; Duru; Rungu; Boyo; Gombari; Atede (all localities in the Uele District) (J. Rodhain). Medje; Akenge (H. Lang and J. P. Chapin).

This species is undoubtedly much more common than the closely allied *C. dimidiata*, although it probably has the same general distribution. It is known at present with certainty from the Gold Coast, Southern and Northern Nigeria, Cameroon, Fernando Po, Spanish Guinea, the Gaboon, and the Belgian Congo.

Chrysops centurionis Austen (1911, Bull. Ent. Res., II, p. 164, fig. 2; ♀; Buanaka, Chagwe, Uganda) is very close to *C. silacea* and Kröber (1927) regards it as only a color variant of that species. The characters which Kröber uses in his key (1927, p. 185) to separate *silacea* and *centurionis* are only partly correct. In these two forms the color of the wings is the same, as figured by Kröber in his Pl. III, fig. 18. Kröber's fig. 19 of the same plate, labelled "*centurionis* Aust. ♀ (nach Austen)" has nothing to do with that species and seems to be a mere fantasy. On p. 221, however, Kröber states correctly that the whole distinction is in the striping of the thorax: in *silacea* the two median chrome-yellow stripes of the dorsum are continuous; in *centurionis* they are described by Austen as "a pair of more or less faint and indistinct chrome-yellow or buff-yellow admedian pollinose stripes, which, starting from front margin, disappear on or shortly before reaching transverse suture, and are again visible close to posterior margin, where they curve round on to the postalar calli." This aspect may be merely due to the pollinosity being partly dulled or rubbed in certain specimens and, if no other differentiating characters can be found, I should synonymize *centurionis* with *silacea*. Attention is here called to this form, because it very likely will be found within the boundaries of the Belgian Congo.

Chrysops langi, new species

Female. — Length, 12.5 mm.; width of head, slightly under 4 mm.; width of frons at vertex, about 1 mm.; length of wing, 11 mm.

A large, dark brown species, closely allied to *C. dimidiata*, with which it agrees structurally;

differing from that species in the more extensive dark color of the abdomen, the first tergite having a dark brown hind margin.

Head: brownish black, ochre-yellow pollinose; an ill-defined transverse band on the vertex darker pollinose; frons about as long as wide; frontal callus broadly elliptical, widely separated from the eyes, mostly brownish black, with a dirty yellowish spot in the center of the lower half; face with two wide, median, brownish yellow, shiny calli which converge above the mouth so as to form a V; jowls with a small, triangular, blackish brown, shiny area close to the lower margin of each eye; pilosity of the head sparse, mostly yellowish, darker on the frons and vertex; ocellar triangle flat, not raised into a callosity. Proboscis about as long as the height of the head; palpi tawny-ochraceous, the apical segment lanceolate, as in *C. dimidiata.* Antennae dark brown (the first segment dirty yellow at base), very long and slender, much as in *C. silacea,* but the second segment somewhat more swollen and markedly thicker than the base of the first; the first one and one-fourth times as long as the second; (third missing in the type). Thorax dorsally subshiny, with a rather faint, light yellowish-gray pollinose, broad, continuous, median stripe which is subdivided by a narrow median darker line; in addition a yellowish pollinose stripe on each side above the wings; pleura and sternum with yellowish pollinose spots partly covered with golden yellow hair; disk of scutellum yellowish-gray pollinose. Abdomen dorsally mostly dark brownish to blackish brown; first tergite broadly pale yellow at the base and on the sides, with the hind margin blackish, more narrowly so in the middle; a regular, rather wide, mid-dorsal, pale straw-yellow stripe runs from the base of the second tergite to the apex of the fourth; a narrower and more irregular stripe of the same color runs on each side near the brownish black lateral margins from the base of the first to slightly beyond the third tergite; venter largely straw-yellow, with a median blackish stripe which is narrow on the second tergite and much wider beyond; pilosity of the dark parts black, very sparse on the paler areas. Legs pale reddish brown; the coxae and terminal segments of the tarsi slightly infuscated; all the tibiae distinctly dilated, those of the fore legs more swollen than the others. Wing fairly uniformly infuscated (blackish brown) in the apical half, from the tips of the basal cells on; a lighter streak in the first submarginal cell, extending from the stigma to the fork of the third vein, and a smaller light spot in the fifth posterior cell base of wing (as far as extreme base of basal cells), entire costal and subcostal cells, as well as a narrow margin along the fifth longitudinal vein, of a paler brown color.

Male. — Length, 12.5 mm.; width of head, 4.5 mm.; length of wing, 10.5 mm.

Head large; eyes contiguous for some distance; triangle of vertex large; ocelli prominent; area of enlarged facets extensive, division between small and large facets very plainly marked, the small facets occupying about one-third of each eye beneath the enlarged facets; the one specimen seen shows a dark band somewhat in front of the posterior eye border and parallel to it, and a spot of the same color some distance before the band. Antennae somewhat more slender than in the female; palpi minute. Color of body, wings and legs and its arrangement the same as in the female, the only apparent difference being that the mid-dorsal yellow stripe of the abdomen is wider and more conspicuous and that there is more black on the apical segments ventrally.

BELGIAN CONGO. — Stanleyville, one female, holotype, one male, allotype, and four females, paratypes, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

C. langi is closely allied to both *C. silacea* Austen and *C. dimidiata* van der Wulp, from which it may be distinguished by the more uniform infuscation of the apical half of the wing and the different color pattern of the abdomen.

Chrysops stigmaticalis Loew

Chrysops stigmaticalis Loew, 1858, Öfvers. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 338 (♀; Caffraria); 1860, 'Dipteren-Fauna Südafrikas,' I, p. 29, Pl. I, fig. 18 (♀). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 45, Pl. II, fig. 11 (♀). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 181, 186, and 235, fig. 9, Pl. III, fig. 23 (♀ ♂).

Chrysops fuscus Ricardo, 1902, Ann. Mag. Nat. Hist., (7) IX, pp. 367 and 368 (♂, erroneously described as ♀; Salisbury, Southern Rhodesia). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 222, fig. 3 (♂).

Chrysops distinctipennis J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 222, fig. 4 (♀). Not of Austen.

The only specimens known from the Belgian Congo were obtained near Bukama in the Katanga: the females were biting an antelope (*Kobus vardoni*), while a male was found resting on the culm of a grass.

C. stigmaticalis is, in my opinion, strictly East and South African, being known positively from Eritrea, Abyssinia, Somaliland, Southern Rhodesia, the Katanga, Portuguese East Africa, Transvaal, Natal, Orange Free State, and Cape Colony. I have seen males from Colubi, Abyssinia (G. Kristensen. — D. Ent. Mus. Dahlem). Kröber alone records this species from West Africa (Mangu Jendi in Togo and Ebolowa in Cameroon), but I suspect that these specimens were *C. distinctipennis* Austen, which is the West African representative of *C. stigmaticalis*.

Chrysops distinctipennis Austen

Chrysops distinctipennis Austen, 1906, 'Second Rept. Wellcome Res. Labor. Khartoum,' p. 53, Pl. IV (♀; Usoga, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 46, Pl. II, fig. 12 (♀). Neave, 1912, Bull. Ent. Res., III, p. 286, Pl. XI, fig. 8 (♀ ♂). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 178, 186, and 250, Pl. IV, fig. 32; Pl. VI, fig. 6 (♀ ♂).

BELGIAN CONGO. — Faradje, one female, April 1911 (H. Lang and J. P. Chapin). Uere River (J. Rodhain).

The true *C. distinctipennis* is, I believe, restricted to the West African Subregion where it occurs in the rain forest proper as well as in the forest galleries of the savanna country. There are definite records from Gambia, the Gold Coast, Togo, Northern Nigeria, the French and Belgian Congo, the Bahr-el-Ghazal District of the Anglo-Egyptian Sudan, Uganda, and the Kavirondo district of Kenya Colony, all of which are within the limits of the West African Subregion. There are only three records from outside that area: one female of the Paris Museum (determined by Austen) said to have been taken near Lake Marguerite, Abyssinia; one female, also of the Paris Museum (determined by Kröber), supposedly from the Sahel of Mauretania; and a record "Bulawayo," by Kröber, the origin of which is unknown. Neave (1912) includes the species in his list of tabanids of Nyasaland, but I have not found a definite locality record from that territory.

Kröber's account of *C. distinctipennis* is very confused and contains some manifest errors. In his key (p. 186) he places it in the group of *C. longicornis*, although it is very closely allied to *C. stigmaticalis*, both species having the same clear spots in the fourth and fifth posterior cells. On p. 250 he describes as a male what appears to have been a female, since he states that the frons is broad, while his description of the wing does not fit Neave's figure of the male. Moreover, he writes here that the fourth and fifth posterior cells are almost entirely hyaline, thus contradicting his figure (Pl. IV, fig. 32) which certainly does not represent the wing of *C. distinctipennis*.

Neave's statement (reproduced by Kröber) that in *C. distinctipennis* "the eyes of the male are small, and only partially meet in the middle line," is contradicted by his figure, which shows the eyes plainly separated by the narrow frons.

Chrysops longicornis Macquart

Chrysops longicornis Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 156, Pl. XIX, figs. 2 and 2*a* (♀; Senegal). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 44, Pl. II, fig. 10 (♀ ♂). J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 220, fig. 1 (♀). Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 180, 187, and 254, Pl. IV, fig. 37; Pl. V, fig. 20; Pl. VI, fig. 9 (♀ ♂).

Chrysops tarsalis Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 200 (♀; Sierra Leone).

Chrysops trimaculatus Bigot, 1892, Mém. Soc. Zool. France, V, p. 607 (♂, erroneously described as ♀; Senegal).

LIBERIA. — Reppo's Town, one female, resting on the under side of a leaf in a bush, at about 7 A.M., August 31, 1926. Moala, one male, also resting on the under side of a leaf in a bush, November 4, 1926. Gbanga, one female also sitting on a leaf, September 14, 1926.

BELGIAN CONGO. — Ile des Princes near Boma, one female. Coquilhatville (J. De Riemaecker). Zambi (Neefs). Malela, June 1915 (H. Lang and J. P. Chapin).

This species appears to be distributed over most of the Ethiopian Region from the Senegal, Uganda, and Kenya Colony to Natal.

The color of the abdomen is variable in this species. In the palest specimens it is dorsally almost entirely reddish yellow (more straw yellow on the second segment), with the first tergite entirely black and an inverted cordiform black spot in the middle of the second tergite (sometimes very small). In the darkest specimens the dorsum of the abdomen is black, except for two large, triangular, pale straw-yellow, lateral spots which unite narrowly in the middle at the anterior margin. These extreme variations occur in both sexes and are connected by intermediary combinations of black and yellowish red on the dorsum of the abdomen. Austen (1909) figures a form which is about midway between the two extremes. The variations are found together and do not seem to be in any way geographically segregated. The palest specimen I have seen came from the Congo rain forest at Coquilhatville; the darkest, from the rain forest of Liberia. The eye markings in life of both sexes are shown in Text Fig. No. 8*c* and 8*d*.

Notwithstanding this variability in color, *C. longicornis* is not connected by transitional forms with *C. funebris* Austen, as I shall show under that species.

Chrysops funebris Austen

Chrysops funebris Austen, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 507 (♀; northeastern side of Lake Edward, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 44, Pl. II, fig. 9 (♀).

Chrysops longicornis var. *funebris* Kröber, 1927, Zool. Jahrb., Abt. Syst., LIII, pp. 180, 187, and 257, fig. 14; Pl. IV, fig. 38 (♀ ♂).

BELGIAN CONGO. — Barumbu, one female resting on a leaf, January 6, 1927. Bena Bendi (R. Mayné). Between Beni and Lesse (Murtula). Uere River (J. Rodhain). Moto (L. Burgeon).

I cannot follow Kröber when he regards *C. funebris* as an extreme melanistic variant of *C. longicornis*. Notwithstanding the considerable variation exhibited by *C. longicornis*, I have had no difficulty in separating *C. funebris* by the characters given in the key. Moreover, the species appears to be restricted to the rain forests of the West African Subregion (not being generally distributed, like *C.*

longicornis), where it is known positively from the Kavirondo District in Kenya Colony, Uganda, and the Belgian Congo. If Kröber's specimen from Alcu, Benito, was correctly identified, *C. funebris* would extend as far west as Spanish Guinea. The eye markings in life are shown in Text Fig. No. 8*e;* they differ little from those of *C. longicornis.*

Tribe Scepsidini

Adersia Austen

Adersia Austen, 1912, Ann. Mag. Nat. Hist., (8) IX, p. 4. Monotypic for *Silvius oestroides* Karsch, 1888. Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 158. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 308.

This genus contains only one species, which has been found in East and South Africa, from Somaliland to the Cape Colony.

Braunsiomyia J. Bequaert

Braunsiomyia J. Bequaert, 1924, Psyche, XXXI, p. 26. New name for *Brodenia* Surcouf, 1921.
Brodenia Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 160. Monotypic for *Brodenia cinerea* Surcouf, 1921. Not *Brodenia* Gedoelst, 1913. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 317.

This interesting tabanid has been so incompletely characterized by Surcouf, that its recognition has given considerable trouble. To begin with, the type specimen of *Braunsiomyia cinerea* was a *female*, not a male as claimed by Surcouf. This explains the unusually wide frons, which is even broader than in the female of *Adersia oestroides*, and the presence of a large frontal callosity. A specimen taken by Dr. H. Brauns at Zwartkops, near Port Elizabeth, now before me, is, I believe, the true male of *Braunsiomyia cinerea:* it has the eyes completely holoptic.

The character of the venation of the wing used by Surcouf to separate *Braunsiomyia* and *Adersia*, — *viz.*, the reduction of the longitudinal veins between the second, third, and fourth posterior cells in the former — is not constant in my opinion. In both *Braunsiomyia* and *Adersia* these veins show a tendency to fade out; but, in what I regard as the male of *B. cinerea*, they are still well marked.

The real differentiating characters between these two genera are those mentioned in my key. Surcouf writes in his key to the genera that the third antennal segment of *B. cinerea* consists of six divisions. In the male before me, one can see seven divisions under the microscope, four in the basal portion and three in the style. On the other hand, a series of three females and seven males of *Adersia oestroides* have eight divisions in the third antennal segment.

Both *Adersia oestroides* and *Braunsiomyia cinerea* were observed by Dr. Brauns on the ocean beach near Port Elizabeth during December. The two sexes rest on the decaying seaweeds accumulated in the drift. Surcouf's surmise that *Braunsiomyia* is a "type adapted to a parasitic life" is a mere speculation not supported by any facts. The mouth-parts of the adult are aborted, and even the female is unable to bite or to take any food whatsoever. The early stages are totally unknown.

Lesneus Surcouf

Lesneus Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 161. Monotypic for *Lesneus canescens* Surcouf, 1921. Enderlein, 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 317.

The only species of this genus was described from Obock (French Somaliland).

SUBFAMILY TABANINAE

Tribe Tabanini

Tabanus Linnaeus

Tabanus Linnaeus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 601. Type by designation of Latreille (1810), accepted by Coquillett (1910): *Tabanus bovinus* Linnaeus, 1758.

Therioplectes Zeller, 1842, Oken's Isis, Jahrgang 1842, Heft XI, p. 819. Type by designation of Coquillett (1910): *Tabanus tricolor* Zeller, 1842.

Atylotus Osten Sacken, 1876, Mem. Boston Soc. Nat. Hist., II, pt. IV, No. IV, pp. 425 and 426. Type by designation of Coquillett (1910): *Tabanus bicolor* Wiedemann, 1821.

Euancala Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 346; 1925, *loc. cit.*, XI, 2, p. 352. Type by original designation: *Tabanus maculatissimus* Macquart, 1838.

Ancala Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 346; 1925, *loc. cit.*, XI, 2, p. 352. Type by original designation: *Tabanus fasciatus* Fabricius, 1775.

Ateloza Enderlein, 1923, Deutsche Ent. Zeitschr., p. 545; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 344. Monotypic for *Ateloza fülleborni* Enderlein, 1923. Not *Ateloza* Enderlein, 1919, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 352 (in Tenthredinoidea).

Brachytomus A. Costa, 1857, Il Giamb. Vico, Napoli, II, 3, p. 445. Monotypic for *Brachytomus ursus* Costa, 1857 = *Tabanus gigas* Herbst, 1787.[1]

Ochrops Szilády, 1915, Ent. Mitt. Berlin, IV, p. 93. Type by designation of Enderlein (1925): *Tabanus plebejus* Fallen, 1817.

Dasystypia Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 347; 1925, *loc. cit.*, XI, 2, p. 370. Type by original designation: *Tabanus rusticus* Linnaeus, 1767.

Straba Enderlein, 1923, Deutsche Ent. Zeitschr., p. 545; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 355. Type by original designation: *Tabanus sudeticus* Zeller, 1842.

Sziladya Enderlein, 1923, Deutsche Ent. Zeitschr., p. 545; 1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 366. Type by original designation: *Tabanus gigas* Herbst, 1787.

Sziladynus Enderlein, 1925, Zoolog. Anzeiger, LXII, p. 181. Type by original designation: *Tabanus aterrimus* Meigen, 1830.

The above synonymy includes only names that have been used for African species. As set forth below, some of them may be retained for natural divisions of the genus, although none of them are in my opinion of more than subgeneric value.

1. *Therioplectes* Zeller contains species with thickly pilose eyes, in which the vertex is somewhat raised in the middle and often more or less divided by a longitudinal depression, but without forming a shiny callosity. As later recognized by Enderlein, his genus *Sziladya* is identical with *Therioplectes*, since *T. gigas* Herbst and *T. tricolor* Zeller are very closely allied. *Brachytomus* Costa is likewise a synonym of *Therioplectes* Zeller (and not of *Atylotus* Osten Sacken, as given by Enderlein), since the type species is the genotype of *Sziladya* Enderlein. In the Ethiopian Region, *Therioplectes* appears to be restricted to the higher mountains, where it represents a Palaearctic element. I regard the following three species as belonging to this subgenus: *T. ruwenzorii* Ricardo

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[1] Listed after Coquillett, who, however, spells it *Brachystomus*. The fuller title of the periodical is "Il Giambattista Vico: Giornale Scientifico." (Napoli.)

Mt. Ruwenzori), *T. amblychromus* Speiser (Mt. Kilimanjaro), and *T. canofasciatus* Austen (Mt. Kenya). *T. imbecillus* Karsch (of Usambara, Tanganyika Territory) is perhaps also a *Therioplectes*, although Karsch described the eyes as bare; but Speiser, who saw the type, states that it is similar to his *T. amblychromus*.

2. *Sziladynus* Enderlein contains species with hairy or pubescent eyes, but with the vertex strongly raised in the middle into a well-defined and often shiny callosity and with the frontal callosity well-developed. It corresponds to *Therioplectes* Enderlein (1925, Mitt. Zool. Mus. Berlin, XI, 2, pp. 346 and 357), not of Zeller.[1] In the Ethiopian Region this group seems to be but scantily represented. I should refer to it *T. nagamiensis* Carter, *T. muluba* J. Bequaert, and *T. subfasciatus* T. Becker.

3. *Atylotus* Osten Sacken contains species with the eyes more or less pubescent (generally strongly so in the male, often very faintly in the female), but with the vertex not raised appreciably. The frontal callosity is reduced to a small shiny spot (often hardly developed or absent) and the median callosity, if at all present, is very small and not connected with the basal spot. The legs are normal, the fore tibiae not swollen. I believe that Enderlein is right in regarding *Ochrops* Szilády as a synonym of *Atylotus*. A comparison of specimens of *T. plebejus* and *T. bicolor* shows that the two are very closely allied. I am also unable to accept *Dasystypia* Enderlein as distinct from *Atylotus*, as the close relationship of *T. rusticus* to *T. bicolor* and *T. plebejus* is evident.[2] The presence or absence of an appendix to the fork of the third longitudinal vein, used by Enderlein to separate *Atylotus* and *Dasystypia*, is altogether too trifling and variable a character, often hardly of specific value. Most of the small Ethiopian species with more or less hairy eyes, placed by Surcouf in his fourteenth and sixteenth groups, appear to belong in *Atylotus*, *viz.*, *T. albipalpus* Walker, *T. ditaeniatus* Macquart, *T. fuscipes* Ricardo, *T. diurnus* Walker, *T. fulvianus* Loew, *T. chevalieri* Surcouf, *T. tenuicornis* Macquart, *T. capensis* Macquart, *T. taeniatus* Macquart, *T. laevifrons* Loew, *T. vexans* Loew, *T. crocodilinus* Austen, and *T. pertinens* Austen.

Szilády, in attempting to correct Enderlein's misinterpretation of *Therioplectes*, has only added to the confusion.[3] He overlooked Coquillett's earlier designation of the type of *Therioplectes* as *Tabanus tricolor* Zeller. Since he regards *T. tricolor* as a mere variety of *T. gigas* Herbst, *Sziladya* Enderlein can only be a synonym of *Therioplectes* Zeller. In redefining *Therioplectes*, Osten Sacken designated no type nor did he attempt to list the European species that remained in that genus. He merely removed to *Atylotus* the two species, *T. fulvus* Meigen and *T. rusticus* Linnaeus, which Zeller had included in *Therioplectes*. Moreover, Szilády's *Therioplectes* corresponds to *Sziladynus* Enderlein, which, as shown above, may be regarded as subgenerically distinct from *Therioplectes* Zeller.

4. *Ateloza* Enderlein is, according to the description, based upon a *Tabanus*

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[1] Surcouf's (1924, 'Les Tabanides de France,' p. 92) subgenus *Therioplectes* likewise is *Sziladynus* Enderlein and not *Therioplectes* Zeller; while his subgenus *Atylotus* covers part of Enderlein's *Sziladya*.

[2] Szilády (1926, Zoolog. Anzeiger, LXVI, p. 327) also synonymized *Dasystypia* with *Ochrops*.

[3] Szilády, Z. 1927. 'Ueber Enderleins Bremsengattung *Sziladya* und *Sziladynus*.' Zoolog. Anzeiger, LXXIV, pp. 202–205.

with hairy eyes, in which the third antennal segment is not of the usual crescent-shape, but is without upper angle, slender, only slightly spindle-shaped in the middle and somewhat compressed laterally. This character is found occasionally in certain species of *Tabanus* and may perhaps be used for a division of subgeneric rank. The description of *Ateloza fülleborni* Enderlein (1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 344; ♀; Langenburg, Tanganyika Territory) reads astonishingly like that of *Tabanus producticornis* Austen (1912, Ann. Mag. Nat. Hist., (8) IX, p. 30; ♀; Umbeluzi River, twenty miles south of Lourenzo Marques, Portuguese East Africa). The latter likewise has the third antennal segment elongate and narrow, awl-like, and has an appendix to the fork of the third longitudinal vein; it is not stated whether the eyes are hairy or bare. Enderlein mentions that in his species the upper branch of the fifth longitudinal vein (M_3) is present only as a short stump on the discal cell, but this peculiarity is probably accidental. *T. producticornis* has also been recorded from Zanzibar and from the coast of Kenya Colony. Since *Ateloza* is preoccupied, I propose for this group the new subgeneric name **Atelozella** (Type: *Ateloza fülleborni* Enderlein, 1923).

5. *Ancala* Enderlein is a fairly natural group of *Tabanus* in which the fore tibiae are considerably swollen. Eyes uniformly colored in life, bare. Wings hyaline with dark cross-bands; fork of third longitudinal vein normally without appendix. This group is strictly Ethiopian and comprises: *T. africanus* Gray, *T. fasciatus* Fabricius, *T. latipes* Macquart, *T. brucei* Ricardo, *T. necopinus* Austen, *T. septempunctatus* Ricardo, and *T. subvittatus* Ricardo.

6. *Euancala* Enderlein agrees with *Ancala* in having strongly swollen fore tibiae and bare eyes; but the eyes are marked in life with numerous rounded spots, the wings are speckled nearly all over with black and hyaline, and the fork of the third longitudinal vein bears normally an appendix. This group also appears to be strictly Ethiopian and contains only two species: *T. maculatissimus* Macquart and *T. irroratus* Surcouf.

7. *Tabanus*, proper, still covers the majority of the Ethiopian species (about 110). Enderlein states that some of the African species belong to his genus *Straba*, but I am unable to use that name for a group of even subgeneric value. According to the author, *Straba* differs only from typical *Tabanus* in the eyes of the male being sharply divided into an upper area of very large facets and a lower area of much smaller facets. In every other respect, however, *T. bovinus* and *T. sudeticus* are so similar that any system which separates them must be regarded as highly artificial.

Some of the Ethiopian species at present left in *Tabanus*, proper, will probably be found to form other natural groups of equal value with those discussed above. Thus *T. rothschildi* Surcouf and *T. morsitans* Ricardo seem to form in some respects the transition between *Tabanus* and *Haematopota*. These two species might perhaps represent in Africa the subgenus *Glaucops* Szilády (1923, Biologia Hungarica, I, 1, pp. 17 and 18), based upon the Palaearctic *Tabanus hirsutus* Villers (= *T. haematopotoides* Jaennicke).

Although, with the confusion now prevailing in the taxonomy of the Tabanidae, it is risky to make any general statement with regard to distribution, it would seem that only *Atelozella*, *Ancala*, and *Euancala* are strictly Ethiopian, the remaining groups being found also in other parts of the world.

KEY TO THE SPECIES OF *Tabanus* OF THE BELGIAN CONGO

In his Monograph of African *Tabanus* (1909), Surcouf has arranged the Ethiopian species into sixteen groups. Some of these are rather well defined and partly correspond to the subgenera defined above. Thus his first group covers *Ancala* Enderlein; his fourteenth and most of his sixteenth groups belong in *Atylotus* Osten Sacken, one species of his sixteenth group being a *Therioplectes;* and his fifteenth group is *Euancala* Enderlein. His remaining twelve groups are based mainly upon combinations of the relative width of the frons, the shape of the frontal callosities, and the abdominal markings. They are rather poorly defined so that certain species may well be sought for in two or more of these groups. Moreover, his grouping has the great disadvantage of placing in different groups species that are undoubtedly related.

So far as the species of the Belgian Congo are concerned, I have found it more practical to divide the *Tabanus*, proper, into two groups only, *viz.*, (1) those with uniformly colored abdomen, and (2) those with the abdomen marked in various ways with spots or stripes. Even so, *T. biguttatus* Wiedemann and *T. xanthomelas* Austen may be placed in either group, since the abdomen may be spotted or unspotted.[1]

1. Fore tibiae much swollen .... 2.
Fore tibiae normal or but slightly widened .... 3.
2. Wing speckled black and hyaline; fork of third longitudinal vein with appendix. Group A (*Euancala*) .... 7.
Wing hyaline with transverse dark bands; fork of third longitudinal vein without appendix. Group B (*Ancala*) .... 8.
3. Eyes densely pubescent. Vertex slightly raised and often with a median longitudinal depression, but without shiny callosity. Group C (*Therioplectes*) .... 11.
Eyes bare or pubescent. Vertex either with a shiny, well-defined callosity or entirely flat .... 4.
4. Eyes more or less pubescent. Vertex with a well-defined, often shiny callosity; the frontal callosity well-developed. Group D (*Sziladynus*) .... 12.
Eyes bare or pubescent. Vertex without callosity and not appreciably raised .... 5.
5. Eyes more or less pubescent, sometimes very faintly so in the female. Frons with the basal callosity either reduced to a small shiny spot, vestigial, or absent; sometimes with a small, disconnected median spot above it. Group E (*Atylotus*) .... 13.
Eyes bare. Basal callosity of the frons always well-developed, large; the median frontal callosity distinct, sometimes free, more often connected with the basal callosity. (*Tabanus*, proper) .... 6.
6. Abdomen (in well-preserved specimens) uniformly colored, without spots or bands of pale pubescence; rarely darker in the middle basally. Group F .... 14.
Abdomen with dark markings on a pale background, or with pale spots or bands of pubescence or pruinosity on a dark background (sometimes covering entire segments or reduced to faint lines or spots). Group G [2] .... 27.

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[1] The present key is based primarily on the females. The males are as yet unknown for many species and are often difficult to correlate with the opposite sex. In most cases, though, my key will indicate the affinities of the males, even when their specific identity is left in doubt.

[2] Badly preserved specimens of *T. secedens*, *T. socialis*, *T. coniformis* and similar species often appear as if with unspotted abdomen.

Group A (*Euancala*)

7. Wing moderately black, abundantly marked with hyaline; basal third and apex with very little black. Tip of abdomen with orange or reddish-yellow pubescence. Length, 14 mm. . . . . *T. maculatissimus.*
Wing much darker, speckled with hyaline; the base and apex extensively blotched with black. Tip of abdomen with black pubescence. Length, 14 to 15 mm. . . *T. irroratus.*

Group B (*Ancala*)

8. Antennae pale yellow in the basal two-thirds, more or less infuscate at the apex. Wing mostly hyaline, the base and a transverse median band pale brownish. Abdomen more or less greenish in life. Length, 14 to 17 mm. . . . . *T. fasciatus.*
Antennae entirely black or dark brown. Wing with darker, more distinct bands which are more or less connected. Abdomen not greenish in life. . . . . 9.
9. Large species, 20 to 21 mm. long, entirely brownish red dorsally; under side of the abdomen black, each sternite with a narrow, yellow, apical margin. Black base of wing not extending into the basal cells and without hyaline spot, not connected with the median band along the anal cell. . . . . *T. brucei.*
Smaller species, 16 to 18 mm. long. Abdomen brownish red, dorsally with black spots in the anterior angles of tergites 3 to 7, each followed by a patch of white hair. Black base of wing extending into the basal cells and with a hyaline spot, also more or less connected with the median band along the anal cell. . . . . 10.
10. Apex of wing hyaline, anterior margin not darkened beyond the median band; the latter shortened so as not to reach the hind margin of the wing. . . . . *T. latipes.*
Apex of wing blotched with black along the anterior margin beyond the median band; the latter reaching the posterior margin of the wing. . . . . *T. africanus.*

Group C (*Therioplectes*)

11. Mostly black; humeral and prealar calli pale yellowish; first and second abdominal tergites broadly reddish-yellow on the sides and hind margins; extreme hind margins of second and following tergites whitish. Legs blackish brown; tibiae dirty white; extreme apices of middle and hind tibiae and distal half of fore tibiae infuscated. Wing subhyaline, with distinct brown stigma. Third antennal segment very slender, a little widened at the base and with a small upper prominence. Frontal callus small, reddish brown, oval, the line proceeding from it indistinct. Length, 16 mm. . . . . *T. ruwenzorii.*

Group D (*Sziladynus*)

12. Mostly blackish brown, densely covered with grayish white pollinosity forming faint longitudinal bands on the thorax and three series of indistinct spots on the dorsum of the abdomen. Wing hyaline, with indistinct, gray stigma. Legs black, the tibiae whitish. Frontal callus large, square; a median, black line above it. Third antennal segment short and much widened at base, with a prominent, blunt upper edge. Length, 12 mm . . . . *T. muluba.*

Group E (*Atylotus*)

13. Abdomen black; with two narrow yellowish stripes removed from the side margins, covered with grayish white pubescence and continuous from the base to near the apex; the median dark band between them with light spots of gray pubescence sometimes forming a continuous stripe, but more often indistinct. Frons with two minute callosities of about equal size. Eyes uniformly colored in life. Length, 13 mm. . . . . *T. ditoeniatus* var. *bipunctatus.*

Group F (*Tabanus*, proper, in part)

14. Head and dorsum of thorax densely clothed with white or yellow pile; the dorsum sometimes with two black spots. Abdomen black, fringed with whitish pile on the sides of the apical segments. Antennae and legs black. Frons broad, two and one-half to

three times as long as wide, with only a basal callosity. Wing dark brown, with clearer, cinereous tip. Length, 17 to 23 mm .... *T. biguttatus.*

Black, brownish red, or yellowish red; the thorax and head not clothed with dense white or yellow pile. Frons over three times as long as wide .... 15.

15. At least the fore tibiae with a more or less conspicuous white, yellowish white, or reddish-yellow basal area, covered with silvery white pile .... 16.

Tibiae almost uniformly reddish brown, yellowish brown or brownish black, often infuscated at the tips, without silvery pile .... 21.

16. All the tibiae bright white on their basal two-thirds; femora black. Palpi dark brown or blackish. Frons about six times as long as wide, distinctly narrowed toward the subcallus. Body black or blackish brown, with black pile. Wing uniformly infuscated. Length, 13 to 16 mm .... *T. boueti.*

Only the fore tibiae with a more or less defined pale ring; the middle and hind tibiae uniformly reddish brown, yellowish brown or brownish black .... 17.

17. Legs and antennae mostly pale yellowish red; fore tibiae occasionally whitish at base; apices of fore tibiae and entire fore tarsi blackish; femora with white pile. Frons about five times as long as wide, scarcely narrowed toward the subcallus; the basal callus pale colored, square and abruptly narrowed above. Body reddish brown, mostly covered with short, yellow hair. Wing tinged with yellow. Length, 11 to 15 mm .... *T. thoracinus.*

Generally larger, with darker legs; the fore femora as a rule reddish brown to blackish, with black pile; in doubtful cases, the frons is distinctly narrowed toward the subcallus and the basal callus is of a different shape. Wing distinctly smoky .... 18.

18. Abdomen pale reddish brown, covered with yellowish hair; antennae and palpi reddish brown; femora blackish brown or more or less reddish; fore tibiae with a broad, conspicuous, white basal half. Frons about five times as long as wide, scarcely narrowed toward the subcallus. Fore tarsi slender. Length, 15 to 16 mm. *T. obscurehirtus.*

Abdomen blackish or dark brownish red, often more or less violaceous, covered mostly with blackish hair .... 19.

19. Fore tarsi slender. Body brownish red; antennae and palpi reddish yellow; legs slightly darker yellowish brown; fore tibiae with the basal third rather inconspicuously dirty white to reddish white. Frons nearly six times as long as wide, slightly narrowed toward the subcallus. Length, 14 to 15 mm .... *T. obscurehirtus* var. *lubutuensis.*

Fore tarsi moderately, though distinctly widened. Antennae, palpi, and middle and hind legs brownish red to black .... 20.

20. Body more reddish brown; thorax and abdomen covered with a bluish gray to violaceous bloom; antennae bright red; pile of face yellowish gray. Frons about six times as long as wide, distinctly narrowed toward the subcallus. Length, 17 to 18 mm. .... *T. ianthinus.*

Body blackish brown, covered with a dark gray pruinosity; pile of face brownish gray. Frons about six times as long as wide, distinctly narrowed toward the subcallus. Length, 14 to 18 mm .... *T. besti.*

21. Abdomen reddish yellow, covered with appressed, yellowish pile, mixed dorsally with minute black hairs; a conspicuous dark, elongate, median dorsal blotch at the base extending over the first, or first and second, tergites, sometimes even over the third. Legs, antennae, and palpi pale yellow, the apices of the fore tibiae and the fore tarsi mostly dark brown; the fore tarsi slightly expanded. Frons about five times as long as wide, slightly narrowed toward the subcallus; the basal callus cuneate and gradually produced above into the median ridge-like callus. Wing very faintly tinged with yellow; the stigma pale ochre-yellow. Length, 9.5 to 12 mm... *T. medionotatus.*

Abdomen uniformly reddish yellow, reddish brown, mahogany brown, to black, without basal dorsal darker blotch .... 22.

22. Legs, antennae, and palpi entirely pale yellow; thorax grayish black, covered with yellow pubescence; abdomen reddish yellow, covered with gray or pale yellowish pile; wings hyaline, with yellow veins and stigma, faintly tinged with yellow in the costal cell. Frons five to six times as long as wide, not narrowed toward the subcallus. Length, 9 to 13 mm .... *T. par.*

Legs not entirely pale yellow; at least the fore tarsi black. Generally larger .... 23.

23. Larger and darker species, 17 to 30 mm. long, usually mahogany brown to black; antennae dark brown to black. Frons six to seven times as long as wide, distinctly narrowed toward the subcallus. Fore tarsi widened.......... 24.

Smaller and generally of a lighter color, 10 to 17 mm. long, the abdomen reddish yellow to reddish brown; antennae bright yellowish red to brownish. Fore tarsi slender.... 25.

24. Abdomen mahogany brown, without bluish gray bloom, slightly shiny. Length, 17 to 23 mm.......... *T. fuscomarginatus.*

Abdomen more blackish brown, dull, densely covered with a bluish gray bloom. Length, 23 to 27 mm. (rarely less).......... *T. ruficrus.*

25. Legs mostly reddish yellow, especially the fore femora; fore tibiae pale yellow or whitish, their apices and the fore tarsi black. Wing faintly tinged with yellow. Frons about five times as long as wide, scarcely narrowed toward the subcallus. Length, 11 to 15 mm.......... *T. thoracinus.*

Legs extensively blackish or dark brown, especially the fore femora.......... 26.

26. Darker, with the wings suffused with brown, especially toward the anterior margin; the veins brown; all the femora dark brown with black pile; palpi dark brownish yellow, with black hairs; pile of the lower part of the face dark brown. Frons five to six times as long as wide, scarcely narrowed toward the subcallus. Length, 13 to 17 mm.......... *T. obscurior.*

Lighter, with the wings suffused with yellow, especially along the anterior margin; the veins yellowish; fore femora dark brown to blackish; middle and hind femora reddish brown, with yellowish pile; palpi pale reddish yellow, mostly with yellowish hair; pile of the lower part of the face reddish yellow. Frons five to five and one-half times as long as wide, scarcely narrowed toward the subcallus. Length, 13 to 14 mm.......... *T. obscuripes.*

Group G (*Tabanus*, proper, in part)

27. Brownish red to black, densely covered with white, silvery, appressed pubescence leaving indistinct, darker, longitudinal stripes on the dorsum of the thorax and four triangular, brown spots at the anterior margins of the third to sixth abdominal tergites. Legs pale reddish brown, the tarsi darker. Wing subhyaline, slightly clouded along the reddish veins. Length, 20 to 23 mm.......... *T. canus.*

Body not mostly clothed in silvery white pubescence; the abdomen not with four triangular spots at the anterior margins of the tergites.......... 28.

28. Wing more or less distinctly and extensively marked with hyaline or paler spots or streaks on a dark brown or black background; a paler triangle filling the distal portion of the second submarginal cell.......... 29.

Wing either hyaline throughout, or uniformly infuscated, or with the anterior margin darker or more yellowish, or infuscated with paler apex, or smoky or spotted on some of the veins.......... 32.

29. Abdominal tergites without median, white spots; first tergite pale brown and entirely covered with golden yellow pile; the three following tergites with narrow, pale, apical margins covered with white or yellow pile; the second to fifth sternites with wider, pale, apical margins. Legs black, the basal half of fore tibiae white. Pale and dark markings of the wing very distinct. Length, 17 to 20 mm.......... *T. billingtoni.*

Second to fifth abdominal tergites with large or small spots of white pile.......... 30.

30. First and second abdominal tergites mostly covered with silvery white pubescence; the second with a median, oval or crescent-shaped, black area and on each side with a dark spot in the extreme anterior corner; the three following tergites each with a low, more or less triangular, median, white spot on the hind margin, that of the fourth continued as a fringe to the hind corners where it widens into a spot; second to sixth sternites with conspicuous, lateral, white spots, faintly connected along the hind margins. Legs black, the fore tibiae with some white pile on their basal two-thirds. Pale and dark markings of the wing very distinct. Length, 10 to 23 mm.
.... *T. marmorosus* var. *congoicola.*

All the dorsal tergites each with a small or large, median, white spot on the hind margin. 31.

31. Pale and dark markings of the wing very distinct; basal half of first submarginal and first posterior, as well as most of the discal cell, clear, forming a transverse band which extends into the marginal and fourth posterior cells. Median pale spots of the tergites large; only the first, second, and fifth with lateral spots in the hind corners; sternites and legs as in the var. *congoicola*.......................... *T. marmorosus.*

Pale and dark markings of the wing very indistinct; no transverse hyaline band in the center of the wing; the wing fairly uniformly infuscated, paler in the center of most of the cells, especially in the discal and second submarginal cells. Median pale spots of the tergites small, connected along the margins with larger pale spots in the hind corners; second to sixth sternites with narrow, white hind margins. Legs black, the basal two-thirds of the fore tibiae conspicuously white. Length, 15.5 to 18 mm. .... *T. obscurefumatus.*

32. Abdomen dark reddish brown, dorsally with broad, dark golden yellow apical margins which expand laterally and form yellowish, median triangles on the middle tergites. Thorax dark brownish black, with yellow hair on the sides. Legs dark; tibiae reddish brown. Frons about four times as long as wide. Wing faintly smoky. Length, 21 to 23 mm.. *T. fulvicapillus.*

Abdomen not dark reddish brown with golden yellow markings as indicated above..... 33.

33. Wing strongly infuscated, with a paler, cinereous apex. Head and thorax densely clothed with white or yellowish pile, sometimes with two black spots on the dorsum. Abdomen either entirely black or with median white or yellowish spots on the third and fourth tergites. Frons about two and one-half to three times as long as wide, with only a basal callosity. Length, 17 to 23 mm............... *T. biguttatus.*

Head and thorax not densely covered with white or yellowish pile contrasting with the black abdomen. In doubtful cases the wing not dark brown with paler apex...... 34.

34. Sides of at least the first three abdominal tergites densely covered with bright yellow or grayish white pile, sometimes continued over the sides of the fourth and fifth; the second and third usually more or less dark in the middle, sometimes but faintly so; the fourth with a median, yellow or white spot close to the anterior margin. Head and thorax covered with grayish white pile. Wing fairly uniformly infuscated.... 35.

The first three abdominal tergites not mostly covered with yellow or grayish white pile. Median pale spot, if present on the fourth segment, situated on the hind margin... 36.

35. Chrome-yellow or grayish white area of the first three abdominal tergites ending abruptly at the hind margin of the third; the median, black area of these tergites narrow and ill-defined, often reduced to a triangular or elongate spot on the second and third, or on the second only. (Male similar to that of *T. biguttatus*, but the wing dark brown throughout, without clearer apex, and the golden spots of the abdomen smaller or indistinct). Length, 20 to 23 mm................................ *T. xanthomelas.*

Chrome-yellow areas of the first three tergites continued over the sides of the fourth and sometimes even of the fifth; the median black stripe separating the two yellow areas much broader and with well-defined edges. (Male more like the female than in *T. xanthomelas*). Length, 22 mm...................................... *T. pluto.*

36. Abdomen only with the hind corners of the tergites and two median pale spots covered with white or yellow hair; the spots placed on the hind margins of the third and fourth tergites and sometimes narrowly connected with the hind corners.......... 37.

Either the third and fourth tergites without median spots, or else there are also median or lateral spots on some of the other tergites.................................... 42.

37. Wing dark brown with clearer, cinereous apex. Length, 17 to 23 mm. (See above). .... *T. biguttatus.*

Wing not dark brown with cinereous apex.. 38.

38. Thorax dorsally with two complete, median, longitudinal, white stripes, which are narrower behind the transverse suture. Abdominal median spots large, not connected with the hind corners. Antennae and legs blackish brown, the tibiae pale reddish. Wing slightly infuscated, especially along the veins; the stigma pale brown. Length, 17.5 mm.. *T. niveinotatus.*

Dorsum of thorax not with complete, median, longitudinal, white stripes. Tibiae almost wholly bright white or cream-colored. Smaller species........................ 39.

39. Median spots of the abdomen, anterior longitudinal stripes of dorsum (distinct as far as the transverse suture), and scutellum covered with golden yellow pile. Length, 11.5 to 12.5 mm.. *T. roubaudi.*

Spots and stripes of abdomen and thoracic dorsum silvery or grayish white........... 40.

40. Wing completely hyaline, the stigma barely indicated. Dorsum of thorax with distinct, longitudinal, white bands in the anterior half (stopping abruptly at the transverse suture) and a posterior, broad, white cross-band; scutellum dark gray. Length, 11.5 mm.......... *T. sharpei.*

Wing slightly clouded, with distinct, brownish stigma.......... 41.

41. Thoracic dorsum rather uniformly cinereous gray anteriorly (as far as the transverse suture), without distinct longitudinal stripes; hind margin of dorsum and basal half of scutellum white; apical half of scutellum dark. Median spots of abdomen low, transverse, half-moon-shaped. Length, 11.5 mm.......... *T. argenteus.*

Thoracic dorsum with two more or less distinct, median, longitudinal stripes in front of the transverse suture; hind margin of dorsum and entire scutellum white. Median spots of third and fourth tergites higher, extending to or close to the anterior margin. Length, 11 to 12.5 mm.......... *T. wellmanii.*

42. Median white spots of the abdomen large and restricted to the third and fourth tergites; in addition, the first five tergites with lateral, white, rectangular triangles, squarely cut off on the inner side. Dorsum of thorax anteriorly with two white, longitudinal stripes, stopping at the transverse suture; its hind margin and the scutellum also white. Legs black, the tibiae mostly white. Fore tarsi not expanded. Wing hyaline. Length, 11 to 12 mm.......... *T. diversus.*

Median white markings, if present on the abdomen, not restricted to a spot on the third and fourth tergites.......... 43.

43. Abdomen reddish, with a black median stripe from the first tergite to near the apex, its borders not very clearly defined. Antennae reddish. Frons about five times as long as wide, parallel-sided; the basal callus nearly square, continued as a broad stripe nearly to the vertex. Legs reddish yellow, the fore femora brown, the tibiae pale yellow with white pubescence; fore tarsi and apex of fore tibiae brown. Wing clear, pale yellow on the extreme outer border, the veins and stigma yellowish, with a short but stout appendix to the fork of the third longitudinal vein. Length, 12 mm. .... *T. obscurestriatus.*

Abdomen not brownish red with a median black stripe.......... 44.

44. First and second abdominal tergites mostly white pruinose and covered with white pile; the second with an anterior, median, dark brown spot deeply incised by a white median triangle on the hind margin; the anterior corners of the second tergite also more or less brownish. Remaining tergites with narrow, white hind margins, raised more or less in the middle of each tergite; sometimes also with lateral, discal, pale spots.......... 45.

First and second tergites not mostly white as contrasted with the remainder of the abdomen.......... 46.

45. Wing hyaline. Triangular, median, pale spots of third to sixth tergites large, almost or quite reaching the anterior margins; the tergites with distinct lateral, discal, pale spots. Palpi dirty white. Length, 13 mm.......... *T. atrimanus.*

Wing slightly smoky along the anterior margin. Triangular, median, pale spots of third to sixth tergites very faint; the lateral, discal spots more or less distinct. Palpi brownish. Length, 9 to 13 mm.......... *T. variabilis.*

46. Wing infuscated, with clearer blotches in the center of most of the cells, darker along the anterior margin before the apex. (See above).......... *T. obscurefumatus.*

Wing not infuscated with clearer areas in most of the cells.......... 47.

47. Abdomen dorsally with a practically continuous and regular, bright white or grayish white, longitudinal, median stripe, which is not or hardly broken by the hind margins of the tergites. Wing hyaline or nearly so, with yellow or brownish stigma.......... 48.

Abdomen with the median stripe broken by the hind margins of the tergites so as to form triangular or trapezoidal spots, or with a median row of spots, sometimes small or indistinct.......... 50.

48. Abdomen dorsally reddish brown, only with a median, well-defined, longitudinal, white stripe and the extreme side margins pale; no lateral stripes or rows of spots. Antennae entirely reddish. Dorsum of thorax with two well-defined, broad, median longitudinal, pale stripes. Frons three to four times as long as wide, with a large basal callus connected with a very large median callus. Length, 10.5 to 12 mm. .... *T. laverani.*

Abdomen with a lateral pale stripe or row of pale spots on each side between the median stripe and the side margin.......... 49.

49. Abdomen dorsally with a more or less continuous, gray band on each side between the median stripe and the side margin; the three stripes almost equally distinct, but the median one the longest. Dorsum of thorax with distinct, longitudinal, gray stripes. Frons three to four times as long as wide, with a transverse basal callus and a much smaller, median, bare spot, the two not or very narrowly connected. Eyes in life dark purple with two bright green or blue cross-bands. Antennae entirely reddish. Length, 10 to 11 mm.......... *T. gratus.*

Abdomen dorsally with a row of more or less disconnected spots on each side between the median stripe and the side margin; these spots less distinct than the median stripe. Dorsum of thorax not or very faintly striped. Frons about five times as long as wide; the large basal callus distinctly connected with the elongate median callus. Eyes in life without bands. Antennae reddish brown basally, darkened at apex. Length, 15 to 18 mm.......... *T. taeniola.*

50. Frons distinctly wider above than below, with a basal, more or less transverse callosity and a much smaller or faint, median, bare spot; the two generally not connected. Eyes in life with two or three cross-bands. Abdomen black, dorsally with three longitudinal rows of grayish white spots beginning on the second tergite, those of the side rows small and oblique. Length, 8 to 10 mm.......... *T. sufis.*

Basal and median callosities of the frons as a rule distinctly connected; or else the abdomen not with three rows of spots as indicated above. Eyes in life without cross-bands.......... 51.

51. Second abdominal tergite without median, pale spot; third to sixth tergites with a median, gray triangle; lateral, well-marked pale spots on the second to sixth tergites. Wing subhyaline, slightly smoky along some of the brown veins. Legs pale ferruginous; the apices of the fore tibiae darker and the fore tarsi almost black. Frons about four and one-half times as long as wide, with a distinct basal callus and a very narrow, median, raised line not connected with the basal callus. Length, 21 mm... *T. brodeni.*

Second abdominal tergite with a median, pale spot; if this is indistinct, the median spots of the other tergites are likewise faint or small.......... 52.

52. Abdomen mostly reddish brown; dorsally with small and rather indistinct or faint, median spots; without or with poorly defined lateral spots.......... 53.

Rows of median and lateral spots well marked on the abdominal tergites.......... 58.

53. Slender species, with conical abdomen, pointed posteriorly. Abdomen brownish red, with blackish apical segments; the median pale triangles faint and easily rubbed off; the lateral spots even less distinct. Legs blackish brown; the tibiae reddish yellow, those of the fore legs darker at apex. Wing hyaline, with brownish veins and stigma. Length, 13 to 14 mm.......... *T. coniformis.*

Species with broader abdomen, not pointed posteriorly; the apical segments not conspicuously darker.......... 54.

54. Smaller, 12 to 15 mm. long. Dorsum of thorax with faint longitudinal stripes.......... 55.

Larger, 16 to 24 mm. long.......... 56.

55. Abdomen pale reddish brown, dorsally with three rows of faintly indicated spots (in unrubbed specimens the spots are present on all the tergites). Wing hyaline, with a slight yellowish tinge due to the yellow veins and stigma. Legs and antennae almost entirely reddish yellow; the fore femora, fore tarsi and apices of fore tibiae darker brownish. Length, 12 to 15 mm.......... *T. gedoelsti.*

Abdomen dark reddish brown, with small, median, pale triangles and lateral bands on the second to fourth tergites; legs reddish brown, the tibiae paler, the tarsi brown to black; fore tibiae very pale at base, with white pile. Wing with brownish costal margin and stigma. Length, 13 mm.......... *T. severini.*

56. Abdomen dark reddish brown, dorsally with a rather indistinct, narrow, grayish, longitudinal stripe somewhat widened and covered with white pile on the hind margins of the tergites, thus forming small spots. Dorsum of thorax covered with gray tomentum and black and brown pile, without longitudinal stripes. Wing very slightly smoky, more so along the costal margin. Legs pale reddish brown. Antennae reddish with darker apex. Length, 16 to 20 mm.......... *T. socialis.*

Dorsum of thorax with well-marked, yellowish gray, longitudinal stripes. Wing more smoky .... 57.

57. Abdomen dark reddish brown, dorsally with a median row of small, grayish white, triangular spots and lateral rows of indistinct reddish spots. Fore femora reddish. Length, 22 to 24 mm .... *T. claripes.*

Abdomen darker or paler reddish brown, dorsally with an indistinct, median, grayish white stripe broken up into small triangles; the sides without or with faintly indicated paler spots. Fore femora dark brown to black. Length, 16 to 22 mm. *T. secedens.*

58. Wing hyaline, at most slightly smoky along the costal margin .... 59.

Wing distinctly smoky or infuscated, or darkened or spotted along some of the veins .. 62.

59. First five abdominal tergites with conspicuous, median, white spots, very large and trapezoidal on the third to fifth; lateral spots also very distinct, forming large rectangular triangles. Frons about three times as long as wide, with large basal and median callosities, which are close together and broadly connected. Length, 9.5 to 12 mm. .... *T. lufirensis.*

Median and lateral dorsal spots of the abdomen smaller and less conspicuous; the lateral spots not forming rectangular triangles. Frons four to six times as long as wide ... 60.

60. Frons five to six times as long as wide. Wing rather distinctly smoky along the costal margin, the stigma much of the same color. Legs almost uniformly pale reddish brown. Length, 17 to 23 mm .... *T. ustus* var. *disjunctus.*

Frons four to five times as long as wide. Wing nearly hyaline with distinct yellowish stigma .... 61.

61. Median spots of the abdominal tergites trapezoidal, truncate anteriorly and with straight sides. Antennae reddish yellow, infuscated toward the apex. Femora generally much darker than the tibiae. Length, 14 to 19 mm .... *T. socius.*

Median spots of the abdominal tergites triangular, pointed anteriorly and with concavely curved sides. Antennae mostly blackish brown. Femora colored like the tibiae or slightly darker. Length, 15 to 18 mm .... *T. sagittarius.*

62. Frons four to five times as long as wide; the median callus broadly spindle-shaped ...... 63.

Frons five and one-half to seven times as long as wide, the median callus linear or slightly dilated .... 65.

63. Wing with distinct smoky spots along the second longitudinal and transverse veins; otherwise nearly hyaline. Abdomen reddish brown, darker at apex; first tergite with a dark, postscutellar spot; second to fourth tergites with a large, triangular, median spot, straight along the sides; no distinct lateral spots, but paler side stripes. Antennae dark reddish brown. Length, 17 to 18 mm .... *T. fraternus.*

Wing uniformly and slightly smoky throughout, without spots. Second to fifth tergites each with a median, pale triangle and distinct yellowish gray, lateral spots .... 64.

64. Dorsum of thorax with four yellowish white, longitudinal stripes (two in the middle and one above the base of each wing). Antennae bright yellowish red, with darker apex. Length, 13.5 to 15 mm .... *T. quadrisignatus.*

Dorsum of thorax with five, very distinct, longitudinal, pale stripes. Antennae reddish yellow with darker apex. Length, 15.5 mm .... *T. distinctus.*

65. Abdomen with a conspicuous series of large, broadly truncate, gray triangles on the middle of the second to fifth tergites, which in addition bear oval, gray, much less conspicuous, lateral spots not connected with the median triangles. Wing dark brown at the base and along the costal border and suffused with brown along some of the veins. Dorsum of thorax with five longitudinal, pale stripes. Legs dull ferruginous; the fore femora, tips of fore tibiae, and all tarsi brownish black. Length, 17 to 21 mm. .... *T. denshamii.*

Median triangles of the tergites not strikingly more conspicuous than the lateral spots. Wing as a rule more uniformly infuscated .... 66.

66. Dorsum of the abdomen with three rows of grayish white triangles; those of each tergite broadly connected along the hind margin. Legs reddish brown. Wing more strongly brownish along the anterior margin and in the stigma. Length, 20 to 22 mm. *T. nyasae.*

Dorsum of abdomen with three rows of grayish white or yellowish triangles; the triangles of each tergite not or very narrowly connected along the hind margin. Wing more uniformly infuscated .... 67.

67. Abdomen pale brownish red, dorsally with broad median triangles which almost or quite reach the anterior margins of the tergites; the lateral spots also large and distinct. Dorsum of thorax with five longitudinal, rather faint, pale stripes. Length, 17 to 23 mm. . . . . *T. ustus.*

Abdomen darker reddish brown to brown, with small, narrow, median triangles which are shortened or very narrowly pointed anteriorly; the lateral spots as a rule much less distinct than the median triangles. . . . . 68.

68. Dorsum of thorax with four very distinct, white gray, longitudinal stripes. Median triangle of third tergite narrowly produced into a long point. Length, 16 to 18 mm. . . . . *T. regnaulti.*

Dorsum of thorax with four faint and rather narrow, dark gray, longitudinal stripes. Median triangle of third tergite shorter, more equilateral, not reaching the anterior margin. Length, 15 to 18 mm. . . . . *T. congoiensis.*

Tabanus maculatissimus Macquart

Tabanus maculatissimus Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 121 (♀; Cape of Good Hope). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 91, Pl. VI, fig. 46 (♀). Neave, 1912, Bull. Ent. Res., III, pp. 293, 313, 315, and 317, Pl. X, fig. 1 (♀ ♂).

Belgian Congo. — Panda River (Mich. Bequaert).

This is the East-and-South African representative of *T. irroratus* Surcouf, being known from Eritrea, Somaliland, Kenya Colony, Tanganyika Territory, the Katanga (Belgian Congo), Northern Rhodesia, Nyasaland, Portuguese East Africa, Transvaal, Natal, and the Cape Province. Dr. Bruce and his co-workers (1911, Rept. Sleep. Comm. Roy. Soc., XI, p. 205 and 211) report both *T. irroratus* and *T. maculatissimus* from Uganda; but I believe that only *T. irroratus* is to be found there, as it is the only species listed from Uganda by Neave (1912, Bull. Ent. Res., III, p. 322). The fauna of Uganda is West African in character.

Tabanus irroratus Surcouf

Tabanus irroratus Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 355 (♀; Lastourville, French Congo). Neave, 1912, Bull. Ent. Res., III, p. 322, Pl. X, fig. 2 (♀).

Belgian Congo. — Uele District, one female (J. Rodhain). Stanleyville, seven females, March 1915, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Semliki (C. Christy). Eala (H. Schouteden).

This species is known from Sierra Leone, the French and Belgian Congo, and Uganda. It is the West African representative of *T. maculatissimus* Macquart and may perhaps be regarded as a geographical race of that species. Austen's recent record of *T. irroratus* from "Tanganyika Territory, Ituru District" (1926, Ark. f. Zool., XVIII B, No. 6, p. 2), is based upon a confusion with the Ituri District of the Belgian Congo, as I shall explain under *T. marmorosus*.

Tabanus fasciatus Fabricius

Tabanus fasciatus Fabricius, 1775, 'Syst. Entomol.,' p. 786 (no sex; Sierra Leone). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 78, Pl. VI, fig. 40 (♀).

Liberia. — Banga, October 1926. Bomboma (near Moala), October 31, 1926.

Belgian Congo. — Eala; Coquilhatville; Bolengi; Lokutu; Budja Libala;

Bolobo; Lulonga; Ukaturaka; Lisala; Nouvelle-Anvers; near Irebu; Bumba; Mistandungu; La Lowa; Lubutu; a common species on board ship on the Congo River. Medje; Stanleyville, several females as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Ruchuru River, attacking hippopotamus, April 17, 1927 (R. P. Strong).

There is considerable variation in the color of the legs, upon which character a number of varieties or subspecies have been based, as may be seen from the following key:

1. Legs entirely black; hind tibiae fringed on the inner and outer side with golden yellow pile........ var. *atripes* (van der Wulp).
   Legs partly greenish yellow........ 2.
2. Tibiae and tarsi all black; hind tibiae fringed with black pile....... var. *nigripes* Surcouf.
   Not all the tibiae black........ 3.
3. Fore tibiae dark brown, lighter at the base which is clothed above with golden pile; middle and hind tibiae greenish yellow; hind tibiae fringed on the outer side with golden pile........ subsp. *niloticus* Austen.
   Fore tibiae entirely black and covered with black pile; middle and hind tibiae greenish yellow........ 4.
4. Hind tibiae fringed on the outer side with golden pile........ var. *mixtus* Surcouf.
   Hind tibiae fringed on the outer side with black pile, rarely mixed with a few golden hairs at the base........ typical *fasciatus*.

Most of these variations appear hardly worthy of distinction by name. They show little if any geographical segregation, except in the case of the subspecies *niloticus* Austen (1906, Second Rept. Wellcome Res. Lab. Khartoum, p. 62, Pl. VI; ♀; Anglo-Egyptian Sudan), which is perhaps restricted to the Sudanese savannas north of the forest belt (Upper Guinea Savanna, Ubangi Savanna, and Sudanese Savanna Districts of J. P. Chapin, 1923, American Naturalist, LVII, p. 121, fig. 11), where it is known from Gambia, Dahomey, Northern Nigeria, French Equatorial Africa, Anglo-Egyptian Sudan, Uganda, and the Nyanza Province of Kenya Colony. There is no definite record of the subsp. *niloticus* having been taken in the Belgian Congo, but it should be looked for in the region of Irumu.

The var. *atripes* (*Tabanus atripes* van der Wulp, 1885, Notes Leyden Mus., VII, p. 75, Pl. V, fig. 4; ♀; Ogowé, Gaboon) has been reported from the Belgian Congo by Surcouf (1912, Bull. Mus. Hist. Nat. Paris, XVIII, p. 144) on the strength of a female from Boma (Cammermeyer). I have not seen this specimen and I am unable to decide whether it was correctly named.

The majority of the specimens I have seen from the Belgian Congo and Liberia belong to the var. *nigripes* Surcouf (1909, Bull. Mus. Hist. Nat. Paris, XV, p. 537; Belgian Congo). A few females from Lisala, Coquilhatville, Ukaturaka and Bolobo have the middle and hind tibiae more or less yellowish and seem to represent the typical *T. fasciatus*.

The var. *mixtus* Surcouf (1914, Rev. Zool. Afric., III, p. 472) was based upon females from Yumbi and Bolobo, Belgian Congo. It is evidently the form intermediate between typical *T. fasciatus* and the subsp. *niloticus*, recorded by Austen from a number of localities in the Gold Coast, Nigeria, the Belgian Congo, and Uganda. I have not seen it.

T. fasciatus and its varieties are almost restricted to the West African Subregion. The southernmost certain record is based upon a specimen obtained by S. A. Neave on the Dikulwe River in Katanga. Miss Ricardo has listed *T. fasciatus* from Damaraland, on the strength of a specimen in the South African Museum, but its occurrence in that locality appears open to question. I also consider J. Lewis' record of this species from the Rovuma River (1887, Societas Entomologica, II, p. 49) as erroneous.

Tabanus brucei Ricardo

Tabanus brucei Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 268 (♀; Ankole, Uganda). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 81, Pl. VI, fig. 41 (♀).

Belgian Congo. — Ruwe; Mfupgwe to Kalumba; mid-Lualaba (S. A. Neave). Sampwe (Van den Heuvel). Between Kwesi and Kilo (L. Bayer). Lomami (J. Schwetz).

T. brucei appears to be a species of the savannas of Central Africa, extending from Uganda westward along the edge of the Congo forest as far as the Lower Congo (Kisantu) and southward over Upper Katanga to Lake Bangweolo and the Chambezi River in Northern Rhodesia.

Tabanus africanus G. R. Gray

Tabanus africanus G. R. Gray, 1832, in Griffith, 'Cuvier's Animal Kingdom,' XV, p. 794, Pl. CXIV, fig. 5 (♀; type locality unknown). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 81, Pl. VI, fig. 42 (♀ ♂).

Tabanus latipes Loew, 1860, 'Dipteren-Fauna Südafrikas,' p. 36 (♀; Cape of Good Hope). Not of Macquart.

Belgian Congo. — Uele River, one female (J. Rodhain). Kayumbi; mid-Lufira River (S. A. Neave).

T. africanus, which has often been confused with *T. latipes* Macquart, occurs over the entire Ethiopian Region from the Gold Coast to the White Nile, Somaliland and the Cape Province.

Tabanus latipes Macquart (1838, 'Dipt. Exot.,' I, 1, p. 119; ♀; Senegal) has been recorded from the Belgian Congo, without definite locality, by Surcouf (1911, Rev. Zool. Afric., I, p. 23). I have seen no specimen from that territory and I regard the above record as doubtful since *T. latipes* was generally confused with *T. africanus*, until Austen pointed out the differences. I have a female of true *T. latipes* from the Upper Volta River, French Sudan.

Tabanus ruwenzorii Ricardo

Tabanus ruwenzorii Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 332 (♀; Mubuku Valley on the eastern slopes of Mt. Ruwenzori, between 5,000 and 7,000 ft., Uganda). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 118, Pl. XI, fig. 81 (♀).

Belgian Congo. — Butagu Valley, on the western slope of Mt. Ruwenzori, at the altitude of 2,000 m., one female taken in the tent in a clearing close to the edge of the mountain forest, April 12, 1914.

This species is known only from Ruwenzori, the nearby Mpanga Forest in Uganda, and Ankole, Uganda. It is decidedly a mountain form, occurring at altitudes between 5,000 and 7,000 ft.

Tabanus muluba J. Bequaert

Tabanus muluba J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 462, figs. 7–8 (♀; Kalengwe, Katanga, Belgian Congo).

This species is known only from the type.

Tabanus ditoeniatus Macquart

Tabanus ditoeniatus Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 126 (♀, Mauritius, and ♂, Réunion).
Tabanus ditaeniatus Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 118, Pl. XI, fig. 82 (♀). H. H. King, 1911, Fourth Rept. Wellcome Res. Labor. Khartoum, vol. B, pp. 117 and 125, Pl. IV, figs. 1 and 2; Pl. V, figs. 1–10 (♀ ♂, larva and pupa).
Atylotus nigromaculatus Ricardo, 1900, Ann. Mag. Nat. Hist., (7) VI, p. 165 (♀; Pretoria, Transvaal).

I refer to the typical, South African, form of this species, a female from Dela-Rey, Western Transvaal (H. Brauns), although it agrees much better with the description of *Atylotus nigromaculatus* Ricardo than with Macquart's original account. It measures 14 mm. in length; the palpi have the usual shape, swollen in their basal half and gradually tapering in their apical half; the frons is about two and one-half times as long as wide and not appreciably narrower above the antennae than at the vertex; the basal frontal callus is partly black and shiny in its lower half, and in the middle of the frons there is a minute denuded, shiny, black spot on one side (probably in fresh condition the whole frons was uniformly covered with gray pruinosity); the eyes (which even under a high magnification show no pubescence) have the peculiar pale glaucous, more or less translucent color so characteristic of many species of *Atylotus*, and show, even in a dried condition, a narrow, dark cross-line running over three-quarters of the eye from a little above the base of the frons; the dorsum of the abdomen bears three subdued longitudinal stripes of gray tomentum partly covered with whitish pile; the legs are pale reddish yellow except for the cinereous coxae and the more infuscate fore tarsi and extreme apices of fore tibiae; the fork of the third longitudinal vein bears a short appendix.

To judge from the descriptions, this specimen differs from *T. albipalpus* Walker, *T. fuscipes* Ricardo and *T. diurnus* Walker in having entirely reddish yellow, and not partly or wholly grayish black, femora. In addition, *T. diurnus* is described as having the frons about five times as long as wide and the eyes without a transverse band; while *T. albipalpus* is said to have slender palpi, not appreciably swollen at the base.

According to S. A. Neave (1915, Bull. Ent. Res., V, 4, p. 319) there can be no question but that *T. ditoeniatus* and *T. fuscipes* are distinct. The males of *ditoeniatus* are larger and much less hairy insects, with a paler thorax and abdomen; while the females are very much paler on the under side, especially of the abdomen.

Surcouf (1909, 'Et. Monogr. Taban. Afrique,' p. 251; and 1921, 'Gen. Insect., Tabanidae,' p. 66) regards *Tabanus fuscinevris* Macquart (1838, 'Dipt. Exot.,' I, 2, p. 184; ♀; "probably from the Cape") as a synonym of *T. ditoeniatus* Macquart. Nothing in the description justifies this conclusion, which is plainly contradicted by the statement: "Antennarum dente elongato." According to Ad. Lutz (1907, Centralbl. Bakt. Paras., Abt. 1, Orig., XLIV, p. 138,) *T. fuscinevris* is a South American species.

As I shall attempt to show in the sequel, *Tabanus bipunctatus* van der Wulp is probably distinct from *T. ditoeniatus*. I also doubt that the East Indian *Tabanus pyrrhus* Walker (1850, 'Insecta Saundersiana,' I, Dipt., p. 47, Pl. II, figs. 4 and 5; ♀♂) is a synonym of *T. ditoeniatus*, as claimed by Miss Ricardo and Surcouf.

It is generally stated that *T. ditoeniatus* occurs over the entire Ethiopian Region and extends into the Oriental Region as far as the East Indies, China, and Japan, but I suspect that several distinct species have been confused under this name. Perhaps *T. ditoeniatus* is strictly South-and-East African. There is even a possibility that the South African insect generally called "*ditoeniatus*" is specifically different from that occurring in Mauritius and Réunion. Since Macquart's time no specimens of *T. ditoeniatus* seem to have been obtained in those islands.

Tabanus ditoeniatus var. **bipunctatus** van der Wulp

Tabanus bipunctatus van der Wulp, 1885, Notes Leyden Mus., VII, p. 75, Pl. V, fig. 5 (♀, in part: specimens from St. George d'Elmina, Gold Coast, only; the specimens from South Africa were typical *T. ditoeniatus*).

BELGIAN CONGO. — Boma, one female. Zambi, one female (Neefs).

SENEGAL. — Ngalon, one female (M. Thiroux).

These three females differ rather considerably from the South African specimen of *T. ditoeniatus* mentioned above. They measure 12 to 12.5 mm. in length; the palpi are swollen and tapering as usual; the head is relatively longer, being more nearly hemispherical; the frons is nearly three times as long as wide and visibly narrower at the subcallus than at the vertex; both the basal and median calli are distinct, shiny black, though small; the eyes (without pubescence under a high magnification) are, in a dried condition, uniformly dark purple without a trace of transverse line; on the dorsum of the abdomen the two lateral gray stripes are well marked, but the median one is very faint; the legs are pale reddish yellow, the coxae and extreme base of the femora cinereous, the fore tarsi and the broad apices of the fore tibiae infuscate; the fore tibiae are decidedly thicker and the fore tarsi are wider than in the South African specimen; the fork of the third longitudinal vein in appendiculate.

I tentatively suggest that most of the West African specimens that have been referred to *T. ditoeniatus* will eventually show somewhat similar differences from those of South Africa and that they represent at least a distinct variety. Surcouf (1909, 'Et. Monogr. Taban. Afrique,' p. 184) states that he saw the type and cotype of *T. bipunctatus* at the Brussels Natural History Museum and that they did not seem to differ from *T. ditoeniatus*. This, however, tells only half of the story; for van der Wulp based his description upon two females from St. George d'Elmina, Gold Coast, in the Leyden Museum, and two others from South Africa in the Brussels Museum. The latter specimens, I have no doubt, were *T. ditoeniatus* as recognized by Surcouf. I venture to suggest that those from St. George d'Elmina were the West African form here described from the Lower Congo and Senegal, for which van der Wulp's name might be retained.

Tabanus boueti Surcouf

Tabanus boueti Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 333 (♀; Lower Ivory Coast); 1914, 'Doc. Scientif. Miss. Tilho,' III, pp. 343 and 344, Pl. III (Dipt.), figs. 3–4 (♀).

Belgian Congo. — Stanleyville, 6 females and 4 males, taken as prey by *Bembix bequaerti* Arnold var. *dira* Arnold, March 1915 (H. Lang).

The females of this series are black rather than blackish brown.

Male (undescribed). — Length of body, 14 to 15 mm.

Extremely similar to the female, but the abdomen is more chocolate brown, contrasting with the black thorax and head. The wings are smoky throughout, a little paler toward the apex and with indications of paler spots in the center of most of the cells. As usual, the head is considerably enlarged; the eyes meet broadly on the vertex and are composed of larger facets in the upper two-thirds.

Four specimens from Stanleyville.

T. boueti is known only from the Ivory Coast, Dahomey, and the Belgian Congo.

Tabanus besti Surcouf

Tabanus besti Surcouf, 1907, Archives de Parasitologie, XI, p. 473 (♀; Gambia); 1909, 'Et. Monogr. Taban. Afrique,' pp. 46 and 55 (♀) (Pl. I, fig. 11, as *boueti* Surcouf?).

Tabanus obscurissimus Ricardo, 1909, Ann. Mag. Nat. Hist., (8) I, p. 272 (♀; Libreville, French Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 73, Pl. V, fig. 37 (♀).

Liberia. — Moylakwelli, October 27, 1926. Kolobanu, October 29, 1926. Bomboma (Moala), October 31, 1926. Banga, October 1926. The eyes in life are uniformly purplish black.

Belgian Congo. — Stanleyville, females and males (Lang and Chapin). Lubutu; Walikale; Djambi; Penge. Makala (Christy). Lomami (J. Schwetz). Bandaie, Uele district (J. Rodhain).

T. besti is a West African species extending from the Gambia to Uganda. In Liberia the typical form is much less abundant than the var. *arbucklei* Austen.

After a careful study of an extensive series of specimens, I am unable to separate *T. obscurissimus*, of the Congo, from *T. besti*, of West Africa proper. I believe that Surcouf was justified in regarding them as identical. The extent of the white, basal band of the fore tibiae is variable and the middle and hind tibiae may be reddish brown to black.

Male (undescribed). — Length of body, 15 to 18 mm.; width of head, nearly 6 mm.; length of wing, 11 mm.

Colored like the female, but the basal, narrow, white ring of the fore tibiae appears to be less marked. Head large. Eyes holoptic; area of large facets extensive, entirely encircled by small facets; band of small facets narrowed at vertex, of about uniform width along the hind margin of the eye nearly to the outer inferior curvature, where it widens rapidly for some distance and then narrows toward the frontal triangle. Third segment of antenna decidedly narrower than in the female.

I have seen several males from Stanleyville, collected by Mr. H. Lang. Together with some females of the same species, they were being carried as prey to the nest by the fossorial wasp *Bembix bequaerti* Arnold var. *dira* Arnold.

Tabanus besti var. **arbucklei** Austen

Tabanus besti var. *arbucklei* Austen, 1912, Ann. Mag. Nat. Hist., (8) IX, p. 363 (♀; Bo, Sierra Leone).

Liberia. — Lenga Town, August 1926. Memmeh Town, August 25, 1926. Du River (Camp No. 3), August 1926. Reppo's Town, September 1926. Gbanga, September 1926. Bakratown, September 30, 1926. Paiata, October 1926. Kolobanu, October 29, 1926. Betala, October 13, 1926. Banga, October 1926. Bomboma (Moala), October 31, 1926. Moylakwelli, October 27, 1926. Mt. Coffee (R. P. Currie. — U.S.N.M.).

This is an extreme variation of *T. besti* in which the pale basal portion of the fore tibiae is reddish yellow instead of white. It is, however, connected by transitional specimens with the typical *T. besti*, which occurs together with it. In Liberia this variety is one of the abundant forest horse-flies, often numerous in clearings or along paths through virgin rain forest.

The var. *arbucklei* is known only from Sierra Leone, Liberia, and the Gold Coast.

At Paiata, Dr. Max Theiler found two females of this tabanid infected with an intestinal flagellate, probably of the genus *Crithidia*.

Tabanus obscurehirtus Ricardo

Tabanus obscurehirtus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 374 (♀; Lutete, Belgian Congo). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 64 and 74, Pl. II, fig. 10 (♀).

Liberia. — Lenga Town, August 13, 1926. The eyes in life are uniformly bright green.

Belgian Congo. — Walikale, January 1925; Isangi, January 8, 1927; Coquilhatville, December 19, 1926. Kabinda (J. Schwetz). Miao (Baugniet). Eala; Ingende (Mayné). Ruwe to Kambove (S. A. Neave). Lukombe (Koller). Stanleyville, one female and one male, prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

Male (undescribed). — Length of body, 16 mm.

Except for the enlarged, holoptic eyes, it shows no difference from the female.

One specimen from Stanleyville.

T. obscurehirtus is a West African species, known from Southern Nigeria, Cameroon, Spanish Guinea, and the French and Belgian Congo.

Tabanus obscurehirtus var. **lubutuensis**, new variety

Female. — Length, about 15 mm.; width of head, 6 mm.; frons at vertex, a trifle over 0.5 mm.; length of wing, 12 mm.

Dorsum of thorax brown, without markings; frons slightly narrowed below; antennae yellowish brown; abdomen brown, slightly lighter colored basally; wings fumose, darkest along the costa; legs largely yellowish brown, fore femora, tips of fore tibiae and their tarsi somewhat darker than the basal parts of the fore tibiae. Eyes bare. All the posterior cells open. Fork of third longitudinal vein without appendix.

Head: frons and face unicolorous, bright yellowish pollinose and pilose; beard very nearly the same color; proboscis dark brown; palpi rather slender, although distinctly larger at base than at apex, reddish yellow; antennae bright yellowish brown, first segment rather small, third segment somewhat elongate, its basal portion rather long with a small basal dorsal tooth, much wider and longer than the annulate portion; frons about six times as long as wide, gradually narrowed below, until at the subcallus it is about two-thirds as wide as at the vertex; frontal callosity filling most of the width of the frons at the subcallus, about twice as long as wide at base, gradually narrowed to the conspicuous, linear, median prolongation which stops about midway to the vertex; eyes uniformly colored in life. Thorax: dark brown above, brown pilose; yellowish brown on sides and venter, and abundantly furnished with rather long yellowish hairs. Abdomen: tergites one, two and base of three brown, the remainder dark brown with mostly black pilosity; first two sternites brown, the remaining dark brown with the posterior margin of each lighter and furnished with a marginal row of backwardly directed bright yellow hairs. Wings almost uniformly fumose; costal margin plainly darkest. Squamae brown. Halteres brown, with the knob mostly pale yellowish. Legs: fore femora dark brown with black hair; fore tibiae of the same color, except the basal third which is yellowish white; fore tarsi slender, black; middle and hind legs yellowish brown; tarsal segments partially infuscated apically.

Belgian Congo. — Lubutu, female holotype and sixteen female paratypes, January 1915; Lusengo (on the Congo River), seven female paratypes, December 23, 1926; Bumba, two female paratypes, December 27, 1926; Lisala, five female paratypes, December 28, 1926; Ukaturaka, four female paratypes, December 24, 1926. Ponthierville, one female paratype, December 27, 1923 (Mich. Bequaert). Uele River, eighteen female paratypes (J. Rodhain).

In the rain forest area of the Belgian Congo, *T. obscurehirtus* is more commonly represented by the form described above in which the base of the fore tibiae is not so conspicuously white; the frons is wider at the vertex and more narrowed toward the subcallus. The color is on the whole darker. In the coloration of the legs the var. *lubutuensis* approaches *T. obscurior* Ricardo, but that species has a wider frons, the wings darker, and the beard dark brown.

Tabanus ianthinus Surcouf

Tabanus ianthinus Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, pp. 212 and 258 (♀; Upper Congo); 1909, 'Et. Monogr. Taban. Afrique,' pp. 46 and 53, Pl. II, fig. 4 (♀).

Tabanus rufocanus "Ricardo" Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 258 (as a synonym of *T. ianthinus*).

Belgian Congo. — Uele River; Bambili (J. Rodhain). Kisantu (Goossens). Kabinda (J. Schwetz). Leopoldville; Nouvelle Anvers, December 22, 1926; Lusengo, December 23, 1926; Coquilhatville, one female and one male, December 19, 1926.

Male (undescribed). — Length of body, 17 mm.; width of head, 6 mm.; length of wing, 13 mm. Colored exactly like the female. Fore tibiae with a conspicuous white ring, covering more than the basal third; fore tarsi distinctly, though moderately widened. Head very large, hemispherical; eyes holoptic; the zone of larger facets occupying about the upper three-quarters of the eye, narrowly separated from the occipital margin. Antennae more slender than in the female.

One specimen from Coquilhatville.

T. ianthinus is strictly West African, being known from Sierra Leone, the French and Belgian Congo, and Angola.

Tabanus par Walker

Tabanus par Walker, 1854, 'List Dipt. Brit. Mus.,' V, Suppl. 1, p. 235 (♀; Port Natal). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 76, Pl. II, fig. 5 (♀).

Atylotus cereolus Bigot, 1892, Mém. Soc. Zool. France, V, p. 644 (♀; East Africa).

Tabanus luteolus Loew, 1858, Öfvers. K. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 341 (♀; Caffraria).

Tabanus rufipes Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 124 (♀; Cape of Good Hope). Not *Tabanus rufipes* Meigen, 1820.

Belgian Congo. — Sampwe (Van den Heuvel). Lomami (J. Schwetz). Wombali (Vanderyst). Ile des Princes (near Boma); Leopoldville. Renzi (Uele); Bafuka (Uele) (J. Rodhain). Zambi (H. Lang and J. P. Chapin).

Natal. — Durban, one female, January, 1917.

This species is found throughout the Ethiopian Region, from Gambia and the Anglo-Egyptian Sudan to the Cape Colony.

Tabanus medionotatus Austen

Tabanus medionotatus Austen, 1912, Bull. Ent. Res., III, p. 329 (♀; eastern shores of Lake Bangweolo, between Luwingu and the mouth of the Chambezi River, Northeastern Rhodesia). Neave, 1915, *loc. cit.*, V, p. 318, figs. 30*a-a'*, Pl. XXVIII, fig. 13 (pupa and larva).

Belgian Congo. — Elisabethville, two females, September 30, 1926 (Mich. Bequaert).

This interesting species, closely allied to *T. par*, is known from Upper Katanga, Northeastern Rhodesia, Southern Rhodesia, Nyasaland, and Portuguese East Africa.

Tabanus thoracinus Palisot de Beauvois

Tabanus thoracinus Palisot de Beauvois, 1805–1821, 'Insectes Recueillis en Afrique et Amérique,' p. 55 (♀; Oware and Benin, Southern Nigeria); Atlas, Pl. I (Dipt.), fig. 4. Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 74, Pl. V, fig. 38 (♀).

Atylotus notarum Bigot, 1891, Ann. Soc. Ent. France, LX, p. 367 (♀; Assinie).

Belgian Congo. — Boma. Bafuka (J. Rodhain). Stanleyville (Lang and Chapin). Sampwe to Lukafu (Valdonio). Kabinda, Lomami (J. Schwetz). Elisabethville (Miss. Leplae). Dikulwe; Kayumba (S. A. Neave). Ruchuru River, attacking hippopotamus, April 17, 1927 (R. P. Strong).

This species is distributed over most of the Ethiopian Region, from Sierra Leone to Northern Nigeria, Uganda, Kenya Colony, Zanzibar, Portuguese East Africa, Rhodesia, and Portuguese West Africa (Benguela).

Tabanus combustus Bigot (1891, Ann. Soc. Ent. France, LX, p. 368; ♀; Assinie, Ivory Coast) has been recorded from the Belgian Congo by Surcouf (1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 212). I have never seen a specimen from that territory. Moreover, the species seems doubtfully distinct from *T. thoracinus* Palisot de Beauvois. Surcouf, who saw the types, says that they differ from *T. thoracinus* "in the more reddish brown coloration, the broader frons, the darker color of the legs, and the black apex of the antenna." In his description, however, he gives the same width of the frons (six times as long as wide) for both species.

Tabanus obscurior Ricardo

Tabanus obscurior Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 276 (♀; Wathen, Belgian Congo).

Belgian Congo. — Stanleyville, five females and eleven males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Miao (Baugniet).

Male (undescribed). — Length of body, 13 to 16 mm.

Of a lighter color than the female, more mahogany brown or reddish brown. Legs more reddish. Eyes very large, holoptic; the area of larger facets occupying about the upper two-thirds and rather widely separated from the occipital margin.

Eleven specimens from Stanleyville.

T. obscurior is known with certainty from the Belgian Congo only. Neave (1912, Bull. Ent. Res., III, p. 322) includes it in the list of Uganda tabanids, but I have been unable to find a definite locality record from that territory.

Tabanus obscuripes Ricardo

Tabanus obscuripes Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 275 (♀; Zegi, Lake Tsana, Abyssinia). Neave, 1912, Bull. Ent. Res., III, p. 298 (♀ ♂).

Belgian Congo. — Kaparawe; between the Lufupa and Lubudi rivers (S. A. Neave). Lubumbashi River (Elisabethville) (Mich. Bequaert).

Northern Rhodesia. — Kafue River (Mich. Bequaert).

Although *T. obscuripes* is very closely allied to *T. obscurior,* I believe it may be separated by the characters given in the key. It is probably the East African representative of *T. obscurior*, being known at present from Abyssinia, Tanganyika Territory, Upper Katanga, Northern Rhodesia, Nyasaland, and Portuguese East Africa. The specimens from Ruwe, Katanga, which Miss Ricardo doubtfully referred to *T. obscuripes*, were almost certainly that species.

Tabanus fuscomarginatus Ricardo

Tabanus fuscomarginatus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 273 (♀; Kampala-Kiadondo, Uganda). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 44 and 50, Pl. II, fig. 1 (♀).

Belgian Congo. — Lisala, December 28, 1927; Djambi (between Bomili and Avakubi); Walikale; Lubutu. Avakubi; Panga; Akenge (H. Lang and J. P. Chapin). Yambema Mabote (Van der Haegen). Lower Kasai (Vanderyst).

I am by no means satisfied that *T. fuscomarginatus* is specifically distinct from the common and widely spread *T. ruficrus* Palisot de Beauvois. I am unable to discover any morphological difference between the two.

T. fuscomarginatus has been recorded from the French Congo, the Belgian Congo, and Uganda.

Tabanus ruficrus Palisot de Beauvois

Tabanus ruficrus Palisot de Beauvois, 1805–1821, 'Insectes Recueillis en Afrique et Amérique,' p. 55 (♀; Oware, Southern Nigeria). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 92, Pl. VII, fig. 48 (♀).

Tabanus rufipes Palisot de Beauvois, 1805–1821, 'Insectes Recueillis en Afrique et Amérique,' Atlas, Pl. I (Dipt.), fig. 3 (♀; probably a clerical error for *ruficrus*).

Tabanus deyrollei Bigot, 1858, in Thomson, Archives Entomol., II, p. 349, Pl. XI, figs. 5 and 5*a* (♀; no locality mentioned, but the specimen came from the Gaboon).

Tabanus pervasus Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 43 (♀; West Africa).

I strongly suspect that *T. dilutius* Surcouf (1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 39; ♀; Libreville, French Congo) will also prove to be a synonym of *T. ruficrus*. It was originally described as a variety of that species.

Liberia. — Gbanga, September 1926. Moylakwelli, October 27, 1926. Paiata, October 1926. Banga, October 1926. Kolobanu, October 19, 1926. Bomboma (Moala), October 31, 1926. The eyes in life are uniformly bright green.

Belgian Congo. — Leopoldville; Lubutu, January 1915; Walikale, January 1915; Oso River, January 1915; Penge, February 1914; on the Congo River near Ukaturaka and near Lulonga, December 1926; Bumba, December 1926; Coquilhatville, December 1926; Isangi, January 1927; La Lowa, January 1927. Between Bolobo and Lukolela; Stanleyville; Garamba; Medje; Pawa (H. Lang and J. P. Chapin). Avakubi; Bafwasende; Mawambi (C. Christy). Kondué (Leonard; Luja). Dima (Koller). Lukula (Daniel). Miao (Baugniet). Lomami (J. Schwetz). Ingende (Mayné). Lukonzolwa (Stappers). Elisabethville (Overlaet).

This species varies considerably in size, the total length being in Liberia from 18 mm. to 22 mm., and in the Belgian Congo from 20 mm. to 27 mm.

T. ruficrus is almost restricted to the West African Subregion, but seems to extend into Upper Katanga. Although S. A. Neave (1912, Bull. Ent. Res., III, p. 315) lists it from Nyasaland, he gives no locality record from that territory and does not mention it again in his later publication on the tabanids of Nyasaland.

Tabanus canus Karsch

Tabanus canus Karsch, 1879, Zeitschr. Ges. Naturwiss., LII, p. 377, Pl. IV, fig. 1 (♀; Chinchoxo, Portuguese Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 110, Pl. IX, fig. 68 (♀).

Tabanus multipunctatus van der Wulp, 1885, Notes Leyden Mus., VII, p. 72, Pl. V, fig. 2 (♀; Chimfimo, Portuguese Congo).

Belgian Congo. — Lisala (on the Congo River), December 26, 1926; Nouvelle-Anvers; Lulonga (on the Congo River); Oso River. Coquilhatville to Mondombe (Wilmin). Bandaie, Uele River (J. Rodhain). Lubulu (Burgeon). Elisabethville (Swalue). Medje; Avakubi; Poko; Stanleyville, two females and one male, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold, March 1915 (H. Lang and J. P. Chapin).

Male (undescribed). — Length of body, 22 mm.; width of head, 8 mm.; length of wing, 19 mm. Similar enough to the female so that the two sexes can be associated easily. The head is large and hemispherical and the eyes are contiguous for a long distance; a very distinct area of enlarged facets, occupying more than half of each eye and surrounded by small facets, most of which, however, are below. Triangle of vertex very small, yellow; frontal triangle mostly gray pollinose, but shiny brown above; proboscis short; palpi small, pale brown pilose. Antenna somewhat yellower and more slender than in the female, although the first segment is fully as large as in the other sex. Thorax slightly browner than in the female; stripes not so conspicuous, gray pollinose and brown pilose. Abdomen: dorsally, first segment brownish gray; second segment gray, with a rather large, roundish, mid-dorsal, brown spot, not reaching either border; third segment gray, with four dark brown, contiguous spots on the anterior margin; fourth segment similar, but the two spots nearest the mid-dorsal line much reduced in size; fifth segment brown, with a large triangle at middle with its base on the posterior margin; other segments dark brown of the same color as the abdominal spots. Venter brown as in the female. Wings and legs as in the female, although the latter appear browner on account of being less pollinose.

One specimen from Stanleyville.

This beautiful insect is apparently restricted to the West African portion of the Congo Basin and the neighboring Portuguese territory of Cabinda. I am inclined to doubt the provenance of the single specimen labelled "Elisabethville" at the Congo Museum, since no other record of the species is known from Upper Katanga.

Surcouf (1911, Rev. Zool. Afric., I, p. 29) states that he saw a female of *T. canescens* Surcouf (1909, Bull. Mus. Hist. Nat. Paris, XV, p. 353; ♀; Beira in the Chari District, French Equatorial Africa) from the Belgian Congo, but gives no locality. This Congo record appears very doubtful. Moreover, *T canescens* is probably not a valid species, but only a small variation of *T. canus*.

Tabanus billingtoni Newstead

Tabanus billingtoni Newstead, 1907, Ann. Trop. Med. Paras., I, p. 46, Pl. III, fig. 1, and Pl. IV, figs. 10–12 (♀♂; Tshumbiri, Bolengi, and Matadi, Belgian Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 96, Pl. VII, fig. 5 (♀).

Tabanus splendidissimus "Ricardo" Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 212 (♀; without description).

Belgian Congo. — Between Bolobo and Lukolela, July 1909; Basoko, July 24, 1909; Stanleyville, females and males, taken as prey by *Bembix bequaerti* Arnold var. *dira* Arnold, April 1915; Niapu, January 1914; Akenge, September 1913 (H. Lang and J. P. Chapin). Lubutu, January 1915; Lisala, December 28, 1926. Dungu (DeGreef). Lebo (J. Rodhain). Kondué (Leonard). Hemptinne-St.-Benoît (Callewaert). Eala (Mayné). Dima (Daniel). Malela, 187 kilom. south of Kindu (Burgeon). Luebo (D. W. Snyder. — U.S.N.M.).

A typically West African horse-fly, known from Dahomey to Angola and the Upper Congo.

Tabanus marmorosus Surcouf

Tabanus marmorosus Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 351 (♀; West Africa); 1909, 'Et. Monogr. Taban. Afrique,' pp. 29 and 33, fig. 9 (on p. 30), Pl. I, fig. 7 (♀).

Tabanus marmoratus "Surcouf, *in litteris*" Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 95, Pl. VII, fig. 52 (♀). Not *Dichelacera marmorata* Bigot, 1892, which according to Surcouf is a *Tabanus*.

Liberia. — Banga, one female, October 1926. In life the eyes were uniformly black, with a slight greenish copper tinge.

This specimen agrees best with Austen's colored figure of the species, except that the ground-color of the entire body is black, rendered more or less slate-gray on head and thorax by a pale pruinosity and pubescence; but Austen remarks that his drawing was a good deal too red as regards the anterior portion of the body. In the Liberian specimen the basal half of the scutellum is covered with black pile. The first and second abdominal tergites are mostly covered with black pile; there is a median spot of white hair and pruinosity on the hind margin, very small on the first, large and triangular on the second; in addition there are larger white spots in the hind corners, not connected with the median spots. The third to fifth tergites each bear a more or less triangular, median, white spot; that of the fourth tergite much larger than the others

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and connected very faintly along the hind margin with smaller spots in the hind corners. The fore tibiae bear very little white pile basally. Hyaline areas of the wing very sharply defined, the median clear band extending well into the fourth posterior cell.

Surcouf's description and figures differ rather markedly from the insect figured by Austen and represent the insect from the Belgian Congo which I describe below as var. *congoicola*. Surcouf states that the female type came from "West Africa" (collected by L. Conradt and in the Madrid Museum; therefore almost certainly obtained in Spanish Guinea or Rio Muni). But he also had before him, in drawing up his description, two other females from the Belgian Congo (one without more definite locality, the other from Bena Bendi). Since Austen states expressly that his figure was prepared from the type, the West African form, as represented in Liberia, should be regarded as the typical *marmorosus*.

T. marmorosus is strictly West African, being known from Sierra Leone, Liberia, the Gold Coast, Southern Nigeria, Cameroon, Spanish Guinea, Uganda, and (in the var. *congoicola*) the Belgian Congo. Its supposed occurrence in Tanganyika Territory (Austen, 1926, Ark. f. Zool., XVIII B, No. 6, p. 2) is based upon a misapprehension; the specimen in question came from the Ituri District, Belgian Congo.[1]

Tabanus marmorosus var. **congoicola**, new variety

Female. — Length, 19 to 22 mm.; width of head, 7 to 7.5 mm.; length of wing, 18 to 20 mm.

A lighter form of *T. marmorosus*, with which it agrees in most respects. Dorsum of thorax lighter, the ground color often shading into reddish brown, and more abundantly covered with grayish tomentum; the scutellum with few black hairs basally. The first and second abdominal tergites are mostly slate-gray and covered with silvery white pubescence; the second with an oval or crescent-shaped, median, black area, covered with black pile, and with similar black areas on each side in the extreme corners; the three following tergites each with a low, more or less triangular, median, white spot on the hind margin; the spot of the fourth tergite the largest and rather broadly connected along the hind margin with the conspicuous white hind corners. Fore tibiae with an appreciable amount of silvery white pile basally. Hyaline areas of wing less sharply defined, the median clear band scarcely entering the fourth posterior cell.

Male. — Length, 21 mm.; width of head, 7 mm.; length of wing, 17 mm.

Head large and hemispherical; eyes bare, contiguous; area of enlarged facets extensive, encircled by small facets; antennae, proboscis, and palpi black; triangle of vertex very small, pale brown in color; frontal triangle normal, extreme upper angle dark brown, remainder gray pollinose with a narrow brown collar around the insertion of each antenna; face gray pollinose and pilose; beard white. Dorsum of thorax grayish brown and clothed with long, fine, white hairs; scutellum white. Abdomen: first tergite mostly dark brown, with a posterior gray margin; the second gray with a rounded, mid-dorsal, dark brown spot closer to the anterior than to the posterior margin; the third dark brown, with a wide, posterior, gray margin which is widest on mid-dorsal line; the fourth similar, but the gray posterior margin more extensive; the fifth similar, but the gray posterior margin very much reduced; the remaining tergites entirely dark brown; ventrally, first sternite pale brown; the second largely pale brown, but with three large, nearly black spots, one

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[1] In this 1926 paper, Austen reports a number of tabanids from "Tanganyika Territory, Ituru District." These insects were obtained by Gyldenstolpe during Prince Wilhelm of Sweden's Expedition to the eastern Belgian Congo, which did not enter Tanganyika Territory. There can be no doubt that the locality meant was the Ituri District, Belgian Congo, a region with a typical West African fauna. Moreover, I have not been able to locate an "Ituru District" on any of the maps of Tanganyika Territory in my possession and Mr. Arthur Loveridge tells me he has never heard of it.

on mid-ventral line and one on each side, and a narrow posterior gray margin; the next three similar to the second, but the black increases at the expense of the pale brown toward the apical segments; the sixth black with a very narrow gray margin; the seventh black. Wing dark, with three hyaline patches, one large across the basal, anal, and axillary cells, another across the discal, first posterior, and first submarginal cells, and a third in the second submarginal cell; the first two are quite extensive and irregular; the wing is marked as in the female, but the dark color is somewhat less intense. Legs black, as in the female.

Belgian Congo. — Between Thysville and Kinshasa, one female holotype, taken in the train, November 25, 1926; Lubutu, one female paratype, January 1915. Stanleyville, two female paratypes, and one male allotype, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

Specimens of *T. marmorosus*, in the Congo Museum, from Mawambi (C. Christy), Lokandu (Burgeon), and Niemba (Pons), not now before me, probably all belong to the var. *congoicola.*

Tabanus obscurefumatus Surcouf

Tabanus obscurefumatus Surcouf, 1906, Bull. Mus. Hist. Nat. Paris, XII, p. 523 (♀; San Benito River, French Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 94, Pl. VII, fig. 50 (♀).

Belgian Congo. — Ganda Sundi, one female (de Briey). Medje (H. Lang and J. P. Chapin).

This species is strictly West African, being known from Sierra Leone, Southern Nigeria, Cameroon, São Thomé, and the French, Belgian, and Portuguese Congo.

The male of *T. obscurefumatus* is as yet undescribed. I have seen two males, described below, which I provisionally refer to this species. The wings are more nearly hyaline than in the female; but the males of two related species, *T. billingtoni* Newstead and *T. marmorosus* Surcouf, differ in a somewhat similar manner from their respective females.

Male (undescribed). — Length of body, 16 mm.; width of head, 6 mm.; length of wing, 14 mm.

Body largely gray pollinose; dorsal abdominal segments beyond the second brown basally; segments six and seven almost wholly brown; legs dark, except the fore tibiae which are white on basal two-thirds or more. Wing nearly hyaline, with costal border before the stigma and extreme apices of marginal and submarginal cells clouded; all the posterior cells open; no stump on the anterior branch of the third vein. Head large, hemispherical; triangle of vertex very small; eyes contiguous for a long distance; frontal triangle gray, with the upper angle yellowish brown; face and cheeks white; beard white; palpi slightly darker than the face, small; proboscis black apically. Antenna black; first segment enlarged, more plainly at apex than at base, distinctly produced above; second segment small, hardly half as long as the first; third segment with the dorsal basal angle not very prominent; annulate portion only about half as long as the basal, rather slender. Area of enlarged facets of the eyes extensive, surrounded by small facets, most of which are below.

Two specimens from Stanleyville, Belgian Congo, the former dated April 7, 1915, and the latter March 1915, collected by H. Lang and J. P. Chapin, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold.

The male here described suggests the same sex of *T. billingtoni* and *T. marmorosus*, but is readily separated from both by the almost hyaline wing and differently colored abdomen.

Tabanus quadriguttatus Ricardo (1908, Ann. Mag. Nat. Hist., (8) I, p. 270; ♀; Nguelo River, Usambara, Tanganyika Territory) has been recorded from the Belgian Congo, without definite locality, by Surcouf (1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 212; and 1911, Rev. Zool. Afric., I, p. 23). In 1908 (Bull. Mus. Hist. Nat. Paris, XIV, p. 222), Surcouf also states that this species is common at Brazzaville and at Irebu (on the French shore of the Congo).[1] I suspect that all these records were based upon misidentifications, the specimens in question being probably *T. obscurefumatus* Surcouf, which is extremely similar in coloration. The most striking difference between these two species is found in the color of the legs, which are entirely black in *T. quadriguttatus;* while in *T. obscurefumatus* the fore tibiae are white over the basal two-thirds. *T. quadriguttatus* differs from *T. marmorosus* in having the first submarginal and first posterior cells infuscated, while the discal cell is almost entirely clear, and in having the abdominal sternites narrowly margined with white.

Tabanus aeneus Surcouf (1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 265; ♀. Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 110, Pl. IX, fig. 67; ♀), known only from the type specimen taken in Cameroon, although placed by Surcouf in his fourth group (with *T. ruficrus*), seems to be more closely allied to *T. obscurefumatus*. The wings are even more distinctly infuscated with paler blotches than in that species; but the median spots are very large on the third to fifth tergites and not connected with spots in the hind corners.

Tabanus tenuipalpis Austen

Tabanus tenuipalpis Austen, 1912, Bull. Ent. Res., III, p. 131, fig. 6 (♀; Obuasi, Gold Coast).

LIBERIA. — Lenga Town, three females, August 15, 1926. Du River, Camp No. 3, one female, August 1926.

In life the eyes are uniformly purplish black.

The Liberian specimens agree perfectly with Austen's description. They differ from *T. obscurefumatus* in the more dark clove brown color of the body and legs and in the palpi being grayish-fawn-colored instead of slate gray. Is *T. tenuipalpis* much more than a paler color phase of *T. obscurefumatus?*

T. tenuipalpis is known from Sierra Leone, Liberia, and the Gold Coast.

Tabanus biguttatus Wiedemann

Tabanus biguttatus Wiedemann, 1830, 'Aussereurop. Zweifl. Insekten,' II, p. 623 (♂; Cape of Good Hope). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 85, Pl. VI, figs. 44 and 45 (♀♂).

Tabanus cerberus Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 149 (♀; South Africa).

Tabanus noctis Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 42 (♂; Cape of Good Hope).

Tabanus tripunctifer Walker, 1850, The Zoologist, VIII, Appendix, p. xcv (♀; Port Natal).

Tabanus cilipes Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 120 (in part; ♀♂; Cape of Good Hope).

BELGIAN CONGO. — Boma, one female; Malela, one female. Zambi, one female (Neefs). Matadi, one male, June 9, 1915 (H. Lang). Uele River, two females (J. Rodhain). Elisabethville, one female, December 1921 (Mich. Bequaert). Kasongo (Prince Albert of Belgium). Bunkeya (S. A. Neave). Kalamu near Boma (Mayné).

The male may be recognized by the dark wings with paler cinereous tips;

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[1] The French Congo records are no longer listed by Surcouf in his Monograph (1909, p. 32).

the head and thorax are black, covered with brown tomentum, sometimes with paler lines on the dorsum; the median pale spot is almost always present on the third and fourth abdominal tergites.

This beautiful and easily recognizable species is distributed over the entire Ethiopian Region, from Mauretania to the Anglo-Egyptian Sudan and the Cape. As earlier mentioned by Loew and more recently confirmed by Austen, it extends into Southern Arabia, as is, moreover, the case with many other truly Ethiopian forms of life (*Belonogaster*, *Glossina*, African anophelines, etc.). In addition to its striking sexual dimorphism, the insect varies somewhat locally in the color of the palpi and of the hair of the head and back of the thorax; while the abdomen of the female may or may not have the median white spots on some of the segments, which are almost always present in the male.

Surcouf in his monograph of African *Tabanus* (1909) has attempted to distinguish local races based upon these variations. Unfortunately his account is very confused and his use of the names proposed by other authors is to some extent erroneous.

On page thirty-eight of his Monograph Surcouf says that the type of *Tabanus biguttatus* Wiedemann no longer exists and "was described by the author in the following terms." He then quotes a short description of both sexes which, however, is not Wiedemann's, but Loew's (1860). Wiedemann originally described *biguttatus* upon the *male* alone, from the Cape. *Tabanus cerberus* Walker (♀), *T. noctis* Walker (♂), and *T. tripunctifer* Walker (♀), all described from South Africa, are synonyms of the typical *biguttatus*. In each case the description mentions that the wings are brown-black with cinereous apex.

In 1838, Macquart described a *Tabanus cilipes* which, as pointed out by Loew, was a composite form. The Latin diagnosis and the first French description were drawn from a *male* of the Cape and apply exactly to Wiedemann's *T. biguttatus*. Macquart then proceeded to describe several *males* from Senegal, one *female* "brought back from Africa by Lalande" (consequently of South Africa), and another *female* of Serville's collection, of unknown provenience. Of these, Lalande's female belongs to typical *biguttatus;* while the males from Senegal and Serville's female are the form which Macquart had previously (1834) called *T. unimaculatus*. Surcouf's conclusion (1909, page 42) that *T. cilipes* Macquart is a synonym of *unimaculatus* Macquart does not, therefore, cover all the facts in the case.

The foregoing discussion is not entirely without interest, for in the 'Genera Insectorum' (1921) Surcouf lists *Tabanus unimaculatus* Macquart as a species distinct from *Tabanus biguttatus* Macquart; while under the latter name he indicates two varieties: *cilipes* Macquart and *croceus* Surcouf. In a later paper (1922, 'Voy. M. de Rothschild Ethiopie, Rés. Scientif., Anim. Artic.,' II, p. 845), he further increases the confusion in apparently distinguishing three varieties, *unimaculatus*, *cilipes*, and *croceus*, from typical *biguttatus*.

In 1907, Surcouf described a var. *croceus* which, he says, "has the size and general aspect of *T. v. unimaculatus* Macquart and differs from it in the yellowhis pubescence which extends over thorax, scutellum, frontal band, cheeks, epistome, and palpi. This pubescence in addition spreads sparsely over the posterior margin of the two abdominal segments[1] and on the lateral margin of the last three." In the key which follows, the palpi are said to be "white," whereas in typical *biguttatus* they are described as "brown";[2] the dorsum of the thorax is also said not to possess black spots in the var. *croceus*, while these are said to be present in typical *biguttatus*.

It does not appear to me that the varieties *unimaculatus* Macquart and *croceus* Surcouf can well be separated from the typical form on the strength of the characters used by Surcouf. Moreover, from the published data it is by no means clear that these three color forms are geographically segregated, as claimed by Surcouf. According to this author, typical *biguttatus* would be found from Khartoum to the Cape, throughout East Africa and also in the Congo Basin; the var. *unimaculatus* would extend from Dakar to the Chad, between 10° and 17° N. lat. and 20° W. and 10° E. long. (Paris Meridian); the var. *croceus* has been recorded from the French Sudan, throughout Upper Guinea, to the lower Congo and Angola.

In the females which I have seen from the Belgian Congo, the head, dorsum of thorax and scutellum are clothed with silvery white pile and there are no black spots on the dorsum; the abdomen is entirely black without spots, the extreme margin and lateral corners of the last three segments alone bearing a silvery white fringe of hair; the palpi are milky white, except for the extreme black tip. The one male from Matadi is black, with slight, grayish brown pollinosity on head and thorax; the abdomen with a large yellowish median spot on segments three and four; the palpi are brown-black, covered with black pile. One could perhaps regard these Congo specimens as belonging to the var. *croceus* Surcouf.

Tabanus sudanicus "Cazalbou," listed by Bezzi (1906, Bull. Soc. Ent. Italiana, XXXVII, (1905), p. 240), has apparently never been described. As suggested by Surcouf, it was perhaps based upon the var. *croceus* of *T. biguttatus*.

T. biguttatus appears to be a case of what may be called partial sexual dimorphism. The more common form of the female is that with unspotted abdomen, while the common form of the male has a pale, median, hairy spot on the third and fourth tergites. Occasionally females are taken with spots similar to those of the male; but males with unspotted abdomen are extremely rare. In the usual form of the female, the dorsum of the thorax is clothed with white pile; occasionally one finds females where this pile is bright golden; such specimens are very rare in most localities, but in certain districts they are seen more often than elsewhere.

Tabanus xanthomelas Austen

Tabanus xanthomelas Austen, 1912, Ann. Mag. Nat. Hist., (8) IX, p. 29 (new name for *T. leucaspis* van der Wulp).

Tabanus corax Neave, 1915, Bull. Ent. Res. V, p. 308, figs. 18*a-b'* and 19; Pl. XXVII, fig. 2 (♀ ♂, larva and pupa). Not *Tabanus corax* Loew, 1863.

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[1] Which of the abdominal segments is not stated.

[2] In the Monograph (1909), the palpi are said to be "blackish" in *biguttatus* and "yellow" in *croceus*.

Tabanus pluto Newstead, 1907, Ann. Trop. Med. Paras., I, p. 45, Pl. IV, fig. 7 (♀). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 58 and 60 (in part), Pl. II, fig. 6 (♀). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 91 (in part), Pl. VI, fig. 47 (♀). Not *Tabanus pluto* Walker, 1848.

Tabanus leucaspis van der Wulp, 1885, Notes Leyden Mus., VII, p. 74, Pl. V, fig. 3 (♀; Gold Coast). Not *Tabanus leucaspis* Wiedemann, 1828.

Belgian Congo. — Leopoldville, one female. Boma, one male. Garamba; Vankerckhovenville; Faradje (H. Lang and J. P. Chapin). Tini and Renzi, Uele River (J. Rodhain). Lusambo (J. Ghesquière). Kabinda (J. Schwetz). Mushie (J. Maes). Dima (Koller). Banana (Etienne).

S. A. Neave, having bred this species, concluded that *T. corax* Loew was identical with *T. leucaspis* van der Wulp (renamed *T. xanthomelas* by Austen). Nothing, however, in Loew's description supports Neave's conclusion. Through the kindness of Dr. Vult Ziehen, I have recently had the privilege of examining Loew's type, now in v. Roeder's collection at the Zoological Institute of the University at Halle a. S. I shall report upon it more in detail elsewhere. Suffice it to say that *T. corax* is not in the least related to *T. xanthomelas* Austen, but belongs in the group of *T. ruficrus* Palisot de Beauvois.

T. xanthomelas seems to be very widely spread over the Ethiopian Region, from French Guinea to Nyasaland. The correct distribution, however, cannot be traced at present, since the species has been generally confused with *T. pluto* Walker. The two species may be separated as indicated in the key.

Tabanus pluto Walker

Tabanus pluto Walker, '1848, List Dipt. Brit. Mus.,' I, p. 153 (♀; Sierra Leone). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 91 (in part; not the figure); 1912, Ann. Mag. Nat. Hist., (8) IX, p. 29.

Liberia. — Mt. Coffee, one male (R. P. Currie).

The true *T. pluto* is most probably restricted to Upper Guinea. The area which it occupies seems to correspond to J. P. Chapin's Upper Guinean Forest and Savanna Districts of the West African Subregion (1923, American Naturalist, LVII, p. 121, fig. 11). It has often been recorded from the Belgian Congo, but I believe upon erroneous identifications. All the specimens which I have seen from that territory were *T. xanthomelas* Austen. I doubt greatly whether true *T. pluto* is found in the French and Belgian Congo, or in Portuguese West Africa.

Tabanus fulvicapillus Carter

Tabanus fulvicapillus Carter, 1912, Ann. Trop. Med. Paras., VI, p. 437, Pl. XXIII, figs. 2 and 7 (♀; Banana, Belgian Congo).

This species is known only from the type locality.

So far as one can judge from the descriptions, *T. fulvicapillus* presents many points of similarity with *T. roubaudi* Surcouf (1909, Bull. Mus. Hist. Nat. Paris, XV, p. 353, ♀; 1909, 'Et. Monogr. Taban. Afrique,' pp. 149 and 155, ♀, fig. 21), known only from the type and two paratypes taken at Pangala (Boule N' Tangou), north of Brazzaville, French Congo. *T. roubaudi* is 11.5 to 12.5 mm. long and has pale spots covered with golden hair in the hind corners of the first four tergites and a median, triangular, golden spot on the third and fourth tergites; the thorax bears dorsally four longitudinal golden stripes, the two middle ones abruptly ending at the transverse suture; the scutellum likewise is covered with golden pile. *T. fulvicapillus* is much larger and is said to have median golden triangles on the middle tergites (which ones is not stated); the median and posterior areas of the thorax were denuded in the type and paratype.

Tabanus niveinotatus, new species

Female. — Length, 17.5 mm.; width of head, 6 mm.; width of frons at vertex, about three-fourths mm.; length of wing, 14.5 mm.

A dark brown, nearly black species, with a mid-dorsal, triangular, silvery spot on the posterior margin of each of the third and fourth abdominal tergites. Scutellum and four entire stripes on the dorsum of the thorax also silvery; the two median thoracic stripes somewhat narrowed and less pronounced behind the transverse suture. Wing hyaline, with most of the veins margined with brownish; stigma nearly black. Legs dark; basal two-thirds of fore tibiae light brown. Eyes bare. All the posterior cells open; fork of third longitudinal vein without appendix.

Head: frons about five times as long as wide, nearly parallel-sided, mottled gray and brown; basal callosity opaque brown, not much elevated, nearly as wide as the frons at lower margin of eyes, rather oblong and connected above with a linear extension which reaches two-thirds of the distance to the vertex; face and cheeks gray pollinose and white pilose; beard white; subcallus entirely grayish pollinose. Antenna dark, nearly black in large part; first segment distinctly enlarged, reddish brown, produced forward dorsally, everywhere black hairy; third segment crescent-shaped, the dorsal protuberance broadly triangular, its apex at the proximal third of the basal division. Palpi of normal size, gradually tapering from a swollen base, slightly infuscated over a yellowish ground color, black hairy; proboscis black. Thorax black, dorsally with four entire, longitudinal, gray stripes: the two middle ones narrowed and less distinct behind the transverse suture; the two lateral ones connected behind with the white area that covers the entire scutellum; sides and venter of scutellum all white and rather long white pilose. Abdomen dark dorsally, with a prominent, triangular, silvery, median spot on each of the third and fourth tergites, not reaching much beyond the posterior half of the tergite and scarcely one-third as wide as the abdomen; venter of abdomen brown, more intense in places; posterior margin of each sternite very narrowly paler. Wing hyaline; stigma long, dark brown; nearly all of the veins rather obscurely margined with brown. Squamae brown. Halteres brown, with apices of knobs paler. Legs: all the femora and tarsi dark brown, nearly black; all tibiae reddish brown and all, especially the fore ones, darkened apically; fore tarsi distinctly widened; pilosity of femora mostly gray; that of tibiae mostly black.

Belgian Congo. — Kabaki near Walikale, one female holotype and one female paratype, January 4, 1915.

This new species belongs in the group with *T. wellmanii* Austen, *T. sharpei* Austen, *T. roubaudi* Surcouf, *T. argenteus* Surcouf, and *T. williamsii* Austen, but may be known from all by the larger size, being five millimeters longer than any of the others mentioned. It differs from all of these, too, in having complete white stripes on the thorax and by not having white tibiae. It appears to be most closely allied to *T. williamsii* Austen (1908, Ann. Mag. Nat. Hist., (8) I, p. 426; ♀), from Northern Nigeria (Jemaas, Nassarawa Province). That species, however, is described as much smaller (12.3 mm.), with the tibiae except tips cream-buff; the light gray stripes of the anterior part of the dorsum extend scarcely beyond the transverse suture; the third segment of the antenna is reddish brown, ferruginous at base, with the last four divisions clove-brown.

Tabanus wellmanii Austen

Tabanus wellmanii Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 225 (♀; Chiyaka district, Portuguese West Africa); 1909, 'Illustr. African Blood-Suck. Flies,' p. 113, Pl. X, fig. 74 (♀).

Belgian Congo. — Renzi (Uele district), two females (J. Rodhain). Aruwimi River, one female (U.S.N.M.).

T. wellmanii is known only from Portuguese West Africa, Northern Rhodesia, and the Upper Belgian Congo.

Tabanus argenteus Surcouf

Tabanus argenteus Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, pp. 264 and 334 (♀; Gaboon). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 114, Pl. X, fig. 75 (♀).

Tabanus argentatus Surcouf and Roubaud, 1908, Bull. Mus. Hist. Nat. Paris, XIV, p. 222 (♀; *lapsus* for *T. argenteus*).

Belgian Congo. — Kirundu, one female, February 1915. Sankuru, one female, April 1925 (J. Ghesquière).

T. argenteus appears to be strictly West African and is probably a species of the rain forest, where it possibly replaces the closely allied *T. wellmanii* Austen. It is known from Sierra Leone, the Ivory Coast, Dahomey, Southern Nigeria, Cameroon, and the French and Belgian Congo.

Tabanus sharpei Austen

Tabanus sharpei Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 226 (♀; Katumbe, northern Nyasaland); 1909, 'Illustr. African Blood-Suck. Flies,' p. 113, Pl. X, fig. 73 (♀).

In a former paper, I have referred to *T. sharpei* two specimens collected in Upper Katanga (Kalengwe and on the Lufira River). This rare fly is known only from Katanga, Northern Rhodesia, Tanganyika Territory, and Nyasaland. According to Neave (1915, Bull. Ent. Res., V, p. 314) it is connected by intermediates with *T. insignis* Loew, of which it is probably only a variety with a marked reduction of the abdominal spots. It should be noted that the true *T. insignis* has not yet been found in Katanga nor elsewhere in the Belgian Congo.

Tabanus diversus Ricardo

Tabanus diversus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 330 (♀; Ruwe, Belgian Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 112, Pl. X, fig. 72 (♀).

Belgian Congo. — Minga, Katanga, October 1924 (C. Seydel).

There are several other Congo records of this species, which seems to be strictly Central African (Katanga, Tanganyika Territory, Rhodesia, and Nyasaland).

I now regard *T. lufirensis* J. Bequaert as a distinct species and not as a variety of *T. diversus*.

Tabanus obscurestriatus Ricardo

Tabanus obscurestriatus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 316 (♀; Congo).

This species is known only from the type, the correct locality of which is unfortunately not known.

Tabanus atrimanus Loew

Tabanus atrimanus Loew, 1858, Öfv. K. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 340 (♀; Caffraria); 1860, 'Dipteren-Fauna Südafrikas,' p. 40, Pl. I, fig. 22 (♀). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 150 and 160, Pl. III, fig. 12 (♀).

Belgian Congo. — On the Congo River near La Lowa, January 16, 1927. Kisantu (Vanderyst). Between the Lufupa and Lubudi rivers (S. A. Neave). Lomami (H. Wilmin). Luebo (H. Schouteden). Basoko to Stanleyville (J. Ghesquière).

T. atrimanus occurs in southern and eastern Africa and extends westward over the Belgian Congo. Curiously enough, there is no record from the Gaboon and the species has never been taken in West Africa proper.

In seven females taken near La Lowa, the eyes in life were greenish purple with a narrow, dark purple, median cross-band, as shown in a figure I have published in 1913 (Rev. Zool. Afric., II, 3, p. 461, fig. 3).

Tabanus variabilis Loew

Tabanus variabilis Loew, 1858, Öfvers. K. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 340 (♀; Caffraria); 1860, 'Dipteren-Fauna Südafrikas,' I, p. 41, Pl. I, fig. 23 (♀). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 116, Pl. X, fig. 73 (♀).

Belgian Congo. — Uere River; Bwasabi (Uele) (J. Rodhain). Elisabethville, one female, October 1921 (Mich. Bequaert). Kambove; Lufupa River to Lubudi River (S. A. Neave).

Northern Rhodesia. — Kafue River, two females, October 22, 1923 (Mich. Bequaert).

T. variabilis is one of the rarer species, but appears to be widely distributed. There are records from the Ivory Coast, Cameroon, French Congo, Belgian Congo, Uganda, Kenya Colony, Tanganyika Territory, Northern Rhodesia, Nyasaland, Portuguese East Africa, and Cape Colony. It appears to be a species of savanna country.

T. varians Surcouf (1900, Bull. Mus. Hist. Nat. Paris, XV, p. 354; ♀; Brazzaville, French Congo), known only from the type, seems to be doubtfully distinct from *T. variabilis*. It should be noted that the latter species was also recorded from Brazzaville. The chief character of *T. varians* appears to be the absence of brownish lateral spots in the white covering on the anterior corners of the second tergite.

Tabanus gratus Loew

Tabanus gratus Loew, 1858, Öfvers. K. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 340 (♀; Caffraria). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 114, Pl. X, fig. 76 (♀).

There are a few Belgian Congo records of this species which appears to be distributed over the entire Ethiopian Region, from the Gambia and Anglo-Egyptian Sudan to the Cape.

Tabanus tritaeniatus Ricardo (1908, Ann. Mag. Nat. Hist., (8) I, p. 311; ♀; Bailundo, Benguela) is a little-known species closely allied to *T. gratus*. Laveran (1908, Bull. Soc. Path. Exot., I, p. 253) has recorded it from La Romée, near Stanleyville, Belgian Congo; but the specimen was almost certainly misidentified. It probably was a small female of *T. gratus*, which species Laveran lists also from the same locality.

Tabanus laverani Surcouf

Tabanus laverani Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 331 (♀; Lower Rio Nunez, French Guinea). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 115, Pl. X, fig. 77 (♀).

Belgian Congo. — Between the Lufupa and Lubudi rivers (S. A. Neave). Leopoldville (H. Schouteden).

This species appears to extend over most of the Ethiopian Region. I agree with Austen (1912, Ann. Mag. Nat. Hist., (8) IX, p. 28) that it is most probably identical with *T. unilineatus* Loew (1852, Ber. Ak. Wiss. Berlin, p. 658; ♀; Tette, Portuguese East Africa), which is known with certainty from the type only. Laveran's records of *T. unilineatus* from French Guinea (1904, C. R. Ac. Sci. Paris, CXXXIX, p. 660; 1907, *loc. cit.*, CXLIV, p. 548) refer, of course, to *T. laverani*, since one of his specimens was made the type of Surcouf's species.

Tabanus sufis Jaennicke

Tabanus sufis Jaennicke, 1867, Abhandl. Senckenberg. Naturf. Ges., VI, p. 332 (♀; Nubia). H. H. King, 1911, 'Fourth Rept. Wellcome Res. Lab. Khartoum,' vol. B, pp. 112 and 126, Pl. I, figs. 4 and 5 (♀♂).

Tabanus alboventralis Newstead, 1907, Ann. Trop. Med. Paras., I, p. 46 (♀; Oyster Creek near the mouth of the Gambia River).

The only two records of this species from the Belgian Congo are a female from the Lufira River, Katanga (J. Bequaert, 1913, Rev. Zool. Afric., II, p. 461), and another from La Romée, near Stanleyville (Laveran, 1908, Bull. Soc. Path. Exot., I, p. 253). As neither of these specimens is before me now, I am unable to confirm the identification, which, at any rate in the case of the specimen of La Romée, appears somewhat doubtful.

T. sufis appears to be essentially a species of the Sudan (Mauretania, Senegal, Gambia, Northern Nigeria, Chari River in French Equatorial Africa, and Anglo-Egyptian Sudan), extending into Lower Egypt. Patton (1920) and Austen (1923) record it from Mesopotamia, and Surcouf (1909) from Jerusalem. Neave (1912, Bull. Ent. Res., III, p. 320) includes it in his list of the tabanids of Kenya Colony, but gives no definite locality for that territory.

Tabanus brodeni J. Bequaert

Tabanus brodeni J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 456, figs. 1–2 (♀; Sankisia, Belgian Congo).

This species is known from the type only.

Tabanus coniformis Ricardo

Tabanus coniformis Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 321 (♀; Ruwe, Belgian Congo).

Tabanus nitidus Surcouf, 1911, Rev. Zool. Afric., I, p. 87 (♀; Kiambi and Niemba Kunda, Belgian Congo).

Belgian Congo. — Between the Lufupa and Lubudi rivers (S. A. Neave). Panda River, October 1920; Elisabethville, December 1920 (Mich. Bequaert).

This interesting small species is fairly common in Upper Katanga, Northern Rhodesia, Nyasaland, and the southwestern part of Tanganyika Territory. It has also been recorded from Bihé and Benguela. Its distribution would seem to cover the "Rhodesian (or Angolan) Highland District" of the East-and-South African Subregion, as delimited by J. P. Chapin (1923, American Naturalist, LVII, p. 121, fig. 11).

Through the kindness of Dr. H. Schouteden, I have before me one of the cotypes of *T. nitidus*, a female labelled "Kiambi et Memba Kunda" (correctly "Niemba Kunda," a locality on the Luvua River, upstream from Kiambi). A careful study of this tabanid has convinced me that it is a badly preserved specimen of *T. coniformis*. It was evidently kept in alcohol, which explains the relatively small (shrivelled) size, the absence of all pilosity, the shiny appearance, and the lack of the abdominal gray markings which, moreover, are faint and readily worn off in *T. coniformis*. This specimen shows once more the futility of describing new species of Tabanidae upon alcoholic material.

Tabanus gedoelsti Surcouf

Tabanus gedoelsti Surcouf, 1911, Rev. Zool. Afric., I, p. 32 (♀; Katanga).

Belgian Congo. — La Panda, August and September 1920; Kasepa River near Elisabethville, September 1923; Kimilolo River near Elisabethville, October 1923. Several females and three males (Mich. Bequaert).

Thus far this species was known only from the two types. The long series which I have seen from Katanga indicate that it is a valid species, closely allied to *T. coniformis* Ricardo. The female differs from that of *coniformis* in the less conical abdomen, the apical segments of which are not conspicuously darkened, in the pale yellowish stigma and veins of the wings, in the broader basal portion of the third antennal segment, and in the pale reddish femora which on the middle and hind legs are hardly darker than the tibiae. Length, 12 to 15 mm.

Male (undescribed). — Length of body, 12 to 13 mm.; width of head, 4 to 4.5 mm.; length of wing, 10 mm.

Shows the usual sexual differences of the group, the abdomen being blotched with dark brown or black near the base of the tergites, toward the middle line and the sides, while the median and lateral markings of whitish pilosity are even fainter than in the female. The entire body is covered with a peculiar cinereous, frosty bloom (also present in the female). One male has the dorsum of the thorax mostly pale reddish brown, while in the other two males the thorax is uniformly black. (This variation occurs also in the female sex). Legs almost entirely pale reddish brown; the apex of the fore tibiae and the fore tarsi black; the coxae and femora sometimes darkened (in one male almost black). Fore tibiae much more slender than in the female. Antennae mostly yellowish red, darker toward the tip; the basal portion of the third segment more slender than in the female. Eyes holoptic, hemispherical, enlarged but variable in size; the zone of larger facets occupying nearly the upper three-quarters of the eye and only narrowly separated from the occipital margin.

Three specimens from Kasepa River near Elisabethville (allotype in the Congo Museum at Tervueren).

Tabanus severini Surcouf

Tabanus severini Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 259 (♀; between Banana and Boma, Belgian Congo); 1909, 'Et. Monogr. Taban. Afrique,' pp. 150 and 163, Pl. III, fig. 14 (♀).

This species is known from two specimens only, the type and another female from the Equator District, Belgian Congo. I have never seen it. In the description one reads that the brown abdomen bears a white triangle on the *third*, *fourth*, and *fifth* segments; but the figure shows median triangles on the *second*, *third*, and *fourth* tergites. Moreover, the species seems to have been described from specimens preserved in alcohol. Although Surcouf includes *T. severini* in his twelfth group, the species seems to be more closely related to *T. gedoelsti* Surcouf and *T. coniformis* Ricardo.

Tabanus socialis Walker

Tabanus socialis Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 45 (♀; "Cape"; according to Austen this indication is erroneous, since Walker's type specimen is labelled "Congo"). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 100, Pl. VIII, fig. 57 (♀).

Atylotus hypoleucus Bigot, 1891, Ann. Soc. Ent. France, LX, p. 368 (♀; Assinie).

Tabanus leonum Bigot, 1892, Mém. Soc. Zool. France, V, p. 680 (♀; Sierra Leone).

Tabanus nigrohirtus Ricardo, 1900, Ann. Mag. Nat. Hist., (7) VI, p. 165 (♀; Bonny, Southern Nigeria).

Atylotus albotomentosus "Bigot" Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' p. 132 (as a synonym of *T. socialis* Walker).

LIBERIA. — Banga, two females, October 1926.

BELGIAN CONGO. — Banana (J. Rodhain). Boma (A. Koller). Malela, in the estuary of the Congo, September 10, 1913.

Tabanus conformis Walker (1848, 'List Dipt. Brit. Mus.,' I, p. 150; ♀), of which *T. fervidus* Walker, *T. janus* Walker, and *T. terminatus* Walker appear to be synonyms, was originally described from the Congo. The species has never been properly recognized, and it seems doubtful whether it is really distinct from *T. socialis*. At any rate, the specimens which I have seen in collections under the name of *T. conformis* were all *T. socialis*.

I have before me a long series of females taken by Dr. J. Rodhain at various localities along the Uele River and which seem to represent a small form of *T. socialis* with blackish femora. I doubt, however, whether they are sufficiently different to warrant a distinct name.

Tabanus testaceiventris Macquart (1847, 'Dipt. Exot.,' Suppl. II, p. 16; ♀), described from "Africa," is another doubtful species related to, or identical with *T. socialis*. Surcouf (1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 212) has recorded it from the Belgian Congo, without giving a locality. In his Monograph (1909, p. 132), however, he states that he does not know the species, although he seems to have seen Macquart's type. Austen's (1909, p. 101) suggestion that *T. testaceiventris* is identical with *T. socialis* is probably correct.

T. socialis is a West African species known from the Senegal to Uganda and the Lower Congo; it has not been found in the Katanga. Austen (1909) has recorded it from Liberia (Monrovia).

Tabanus secedens Walker

Tabanus secedens Walker, 1854, 'List Dipt. Brit. Mus.,' V, Suppl. 1, p. 224 (new name for *T. tibialis* Walker). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 96, Pl. VII, fig. 54 (♀).

Tabanus tibialis Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 162 (♀; West Africa). Not *Tabanus tibialis* Macquart, 1845.

Tabanus blanchardi Surcouf, 1907, Archives de Parasitologie, XI, p. 473, Pl. IX, figs. 3 and 4 (♀; "British Guinea, between 6° N. and 8° N., and 3° E. and 5° E."; this is in Southern Nigeria).

Tabanus brunnescens Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 322 (♀; Gold Coast).

Tabanus garonensis Macquart, 1855, 'Dipt. Exot.,' Suppl. V, p. 23 (♀; Gaboon).

Tabanus gabonensis Bigot, 1858, in Thomson, Archives Entomol., II, p. 348 (♀).

? *Tabanus ignotus* Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' p. 223, Pl. III, fig. 5 (♂; Brazzaville, French Congo). Not *Tabanus ignotus* Rossi, 1790 (= *T. gigas* Herbst, 1787).

LIBERIA. — Banga, October 1926. Bomboma (Moala), October 31, 1926.

BELGIAN CONGO. — Lokutu, December 23, 1926; Budja Libala, December 25, 1926; Lisala, December 26, 1926; Bolengi, December 28, 1926; Lulonga, December 1926; Bumba, December 27, 1926; Ukaturaka, December 24, 1926; Barumbu, January 6, 1927; on the railroad between Stanleyville and Ponthierville, January 15, 1927; Coquilhatville, December 20, 1926; Isangi, January 8, 1927; Irebu, December 17, 1926; Nouvelle-Anvers, March 15, 1915; Lubutu, January 30, 1915; between Penge and Irumu, March 1, 1914. Uele District (J. Rodhain). Basoko; between Bolobo and Lukolela; Stanleyville, twenty-five females and nine males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Moto (Thélie). Bongo (J. Maes). Kabambare (Flamand). Miao (Baugniet). Mobeka (Prince Albert of Belgium). Buta (de Calonne Beaufaict). Mawambi (C. Christy).

This common and widely distributed species is rather variable in size and color markings, so that it readily lends itself to the making of so-called "species" based upon extreme individual variations. Surcouf has attempted to distinguish between *T. secedens*, *T. blanchardi*, and *T. gabonensis* (1922, 'Voy. M. de Rothschild Ethiopie, Rés. Scientif., Anim. Artic.,' II, pp. 855–856), but the characters which he uses in his key will hardly serve the purpose.[1] *T. blanchardi* was evidently based upon unusually small specimens with a well-marked, median, pale stripe on the abdomen and with the lateral markings obsolete. These three peculiarities are found, in various combinations, among a large series of specimens taken on the Congo River. The distinction which Surcouf draws between *T. gabonensis* and *T. secedens* is even more elusive. He says that in the former the median stripe of the abdomen is, as a rule, continuous, while there are no lateral spots ("Bande médiane généralement continue. Pas de taches sous-médianes"). Both these characters again are present or absent in specimens of *T. secedens* taken at the same spot and the same day. The different appearance of the specimens is undoubtedly due in many cases not to individual variation properly speaking, but to fortuitous circumstances, such as to whether they are freshly emerged or worn, fed or starved, as well as to the method of collecting and to their age in collections.[1]

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[1] On p. 855, I am credited with the statement that the eyes of the male of *T. secedens* are uniformly bright green. This is an error, since my description of the eyes in life refers to the female (1913, Rev. Zool. Afric., II, 3, p. 455).

T. secedens is strictly West African, extending from the Gambia to Uganda. Austen (1909) has recorded it from Liberia (Bafu Bay and Sino). It occurs over most of the Belgian Congo as far south as the Lubudi River; but it has not been taken in Upper Katanga. S. A. Neave (1915, Bull. Ent. Res., V, p. 130) states that he took near Mt. Mlanje, southern Nyasaland, four females and one male "of what appears to be a form of or perhaps a distinct species allied to *T. secedens* Walk." Since this is the only East African record, the identification is open to question.[2]

Commenting upon the abundance of *T. secedens* in Ashanti, Graham (1909, 'Rept. Ent. Observ. Ashanti,' p. 9) writes: "Herds of cattle driven along the Cape Coast road are sometimes accompanied by great swarms of these flies making a hissing noise like that made by a windstorm."

Tabanus kingsleyi Ricardo

Tabanus kingsleyi Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 318 (♀; Port Lokkoh, Sierra Leone). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 98, Pl. VII, fig. 55 (♀).

LIBERIA. — Mt. Coffee (R. P. Currie. — U.S.N.M.

T. kingsleyi is strictly West African, being known from Sierra Leone, Liberia, the Gold Coast, and Southern Nigeria.

Tabanus claripes Ricardo

Tabanus claripes Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 323 (♀; Leopoldville, Belgian Congo). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 124, 126, and 222, fig. 18, and Pl. III, fig. 3 (♀♂).

BELGIAN CONGO. — Lubudi River (J. Rodhain). Hemptinne-St.-Benoît (Callewaert).

A species apparently restricted to the Congo Basin. Whether it extends into Katanga appears doubtful. The specimens which I have formerly recorded from that region (1913, Rev. Zool. Afric., II, 3, p. 455) were probably misidentified. Moreover, it is by no means certain that *T. claripes* is not an extreme individual variation of *T. secedens* Walker.

Tabanus lufirensis J. Bequaert

Tabanus diversus var. *lufirensis* J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 460 (♀; Lufira River, Belgian Congo).

BELGIAN CONGO. — Elisabethville (Mission Leplae). Miao near Luluabourg (Baugniet).

These specimens have been compared with the type. *T. lufirensis* is known only from the Katanga and southern Kasai. It appears to be related, not to *T. diversus* Ricardo (as previously stated), but rather to *T. quadrisignatus* Ricardo, from which it may be separated as follows:

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[1] The horse-flies taken by Ghesquière on the Congo River and referred by him to *T. gabonensis* (Vanderyst, 1928, Bull. Agric. Congo Belge, XIX, p. 621), all belong to what I here call *T. secedens*.

[2] Austen's (1926, Ark. f. Zool., XVIII B, No. 6, p. 3) more recent record from "Tanganyika Territory, Ituru District," is based upon a confusion with the Ituri District, Belgian Congo, as I have explained under *T. marmorosus*.

Larger (13.5 to 15 mm.), with more reddish-brown abdomen and more yellowish abdominal markings; dorsum of thorax with four yellowish longitudinal stripes; wings slightly, but distinctly smoky. Frons four to four and one-half times as long as wide at vertex, the basal callus about twice as high as wide............ *T. quadrisignatus.*

Smaller (9.5 to 12 mm.), with blackish abdomen and grayish white abdominal markings; dorsum of thorax with four grayish white stripes; wings hyaline. Frons about three times as long as wide at vertex, the basal callus but little or not higher than wide. .... *T. lufirensis.*

Tabanus quadrisignatus Ricardo

Tabanus quadrisignatus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 320 (♀; Ruwe, Katanga, Belgian Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 111, Pl. IX, fig. 69 (♀).

Belgian Congo. — Kambove; Lufupa River to Lubudi River; mid-Lufira (S. A. Neave). Sampwe to Lukafu (Valdonio). Elisabethville, October and November (Mich. Bequaert). Renzi (Uele); Bafuka (Uele); Wandu (Uele) (J. Rodhain). Faradje (H. Lang and J. P. Chapin). Leopoldville. Inongo (J. Maes). Kabinda (J. Schwetz). Wombali (Vanderyst). Moto (Burgeon).

Northern Rhodesia. — Kafue River, October 1923 (Mich. Bequaert).

A widely distributed species, known from Sierra Leone, Southern Nigeria, the French and Belgian Congo, Uganda, Tanganyika Territory, Northern Rhodesia, and Nyasaland. It appears to be an insect of savanna country.

Tabanus ustus Walker

Tabanus ustus Walker, 1850, The Zoologist, VIII, Appendix, p. xcv (♂; Port Natal). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 108, Pl. IX, fig. 65 (♀).

Tabanus bovinus Loew, 'Dipteren-Fauna Südafrikas,' I, p. 38 (♀). Not *Tabanus bovinus* Linnaeus.

Atylotus namaquinus Bigot, 1892, Mém. Soc. Zool. France, V, p. 646 (♀; Port Natal).

Tabanus temperatus Walker, 1856, 'Insecta Saundersiana,' I, Dipt., p. 451 (♀; Port Natal).

Belgian Congo. — Mayombe (Cabra). Upper Lualaba; mid-Lufira; Lufupa River to Lubudi River (S. A. Neave). Renzi (Uele); Dungu (J. Rodhain). Niangara (H. Lang and J. P. Chapin). Elisabethville (Mich. Bequaert). Between Ankoro and Kiambi.

Northern Rhodesia. — Victoria Falls (H. C. Raven. — U.S.N.M.).

All the specimens which I have seen from the Belgian Congo belong to the var. *disjunctus* Ricardo (*Tabanus disjunctus* Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 325; ♀; Lutete, Lower Belgian Congo), which, however, is hardly worthy of recognition. It differs only in the color of the wings, which in the typical *T. ustus*, of South Africa, are strongly tinged with brown; while in the more northern var. *disjunctus* they are mostly subhyaline and slightly infuscate toward the anterior margin. So few South African specimens appear to exist in collections that it is impossible to decide upon the value of so slight a character.

Tabanus inhambanensis Bertoloni (1861, Mem. Accad. Sci. Bologna, XII, p. 54, Pl. I, fig. 7; ♂; Inhambane, Portuguese East Africa), known from the type only, was evidently based upon a male of *T. ustus* var. *disjunctus*.

T. ustus (with its var. *disjunctus*) appears to be a species of the African savannas, south and east of the rain forest belt. In the east it occurs as far north as the grasslands of Uganda and of the Upper Uele country. Southward it extends to Cape Colony.

Tabanus distinctus Ricardo

Tabanus distinctus Ricardo, 1908, Ann. Mag. Nat. Hist., (8) I, p. 326 (♀; Benguela). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 94 and 115 (♀).[1] H. H. King, 1911, 'Fourth Rept. Wellcome Res. Lab. Khartoum,' vol. B, p. 112, Pl. II, fig. 1 (♀).

A number of records of this species have been published for the Belgian Congo, but they may all have been based on erroneous identifications. The species does not appear to be represented in the material now before me. Moreover, there is a possibility that *T. distinctus* is not specifically distinct from *T. ustus* Walker, as was suggested by Surcouf (1921, 'Gen. Insect., Tabanidae,' p. 88).

Tabanus congoiensis Ricardo

Tabanus congoiensis Ricardo, 1908 (April), Ann. Mag. Nat. Hist., (8) I, p. 328 (♀; Wathen, Belgian Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 99, Pl. VIII, fig. 56 (♀).

Tabanus lemairei Surcouf, 1908 (April), Bull. Mus. Hist. Nat. Paris, XIV, p. 123 (♀; Katanga District, Belgian Congo).[2]

Tabanus congolensis Bruto da Costa, Firmino Sant'Anna, Correia dos Santos, and de Araujo Alvares, 1916, 'Sleeping Sickness in Principe,' pp. 218 and 232.

The descriptions of *T. congoiensis* and *T. lemairei* appeared almost simultaneously and it is difficult to decide which name has priority. The probability, however, is in favor of Miss Ricardo's name.

BELGIAN CONGO. — Djambi (between Bomili and Avakubi), one female, December 22, 1914; Lubutu, January 26, 1915. Bafuka, Uele District (J. Rodhain). Niangara; Lisala; Coquilhatville; Stanleyville, seven females and two males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

Male (undescribed). — Length of body, 18 mm.; width of head, 6.5 mm.; length of wing, 14 mm. In coloration very similar to the female, but the light markings of the dorsum of the abdomen smaller and less distinct; the pale stripes of the thorax also fainter, the dorsum being more abundantly covered with dark pile. Head large, hemispherical, with holoptic eyes; area of enlarged facets sharply delimited, occupying most of the upper two-thirds of the eye but separated from the posterior orbit by a broad band of small facets. Third segment of antenna more slender than in the female.

One specimen from Stanleyville.

T. congoiensis is a strictly West African species, known from Sierra Leone, São Thomé, Cameroon, Principe, the French and Belgian Congo, and Portuguese West Africa. Surcouf's type of *T. lemairei* was probably obtained in the Lower Katanga, the fauna of which is West African.

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[1] In Surcouf's Monograph, Pl. II, Fig. 15 is referred to *T. distinctus* in the text (p. 115); but on the plate itself it is called *T. congoiensis* Ricardo, and the figure certainly looks more like that species.

[2] I have seen a reprint of Surcouf's paper bearing the date "Avril 1908."

Tabanus regnaulti Surcouf

Tabanus regnaulti Surcouf, 1912, Bull. Soc. Ent. France, p. 183, fig. 1 (on p. 184) (♀; Sangha River, French Congo).

BELGIAN CONGO. — Walikale, January 1915; Lubutu, January 26, 1915; Penge, February 1914. Mawambi (C. Christy). Ponthierville, December 27, 1923 (Mich. Bequaert). Stanleyville, March 1915, seven females and four males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin).

Male (undescribed). — Length of body, 27 mm.; width of head, 5.5 mm.; length of wing, 14 mm.

Resembling the female closely and readily associated with it. The abdominal markings are somewhat less conspicuous, which is the usual sexual difference in this group of *Tabanus*. The basal ring of the fore tibiae is pale reddish rather than white. Head hemispherical; the eyes holoptic, with a zone of larger facets very sharply set off, occupying more than the upper two-thirds and widely separated from the occipital margin.

Four specimens from Stanleyville.

This species agrees in many respects with *T. quadrisignatus* Ricardo, having also four conspicuous longitudinal stripes over the dorsum of the thorax. It differs, however, in many particulars, notably in the width of the frons which is over five times as high as wide at the vertex.

T. regnaulti is a species of the Congo rain forest, which has not yet been found in Upper Guinea.

Tabanus nyasae Ricardo

Tabanus nyasae Ricardo, 1900, Ann. Mag. Nat. Hist., (7) VI, p. 164 (♀; Fort Johnston, Nyasaland). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 109, Pl. IX, fig. 66 (♀).

Tabanus tarsalis C. F. Adams, 1905, Kansas Univ. Sci. Bull., III, p. 151 (♀; Salisbury, Southern Rhodesia).

BELGIAN CONGO. — Elisabethville (Mich. Bequaert). Lufira River (J. Rodhain). Mid-Lualaba; Kambove to Lukafu; mid-Lufira; Bunkeya to Kambove; Mfungwa (Sampwe) to Kayumba; Kambove (S. A. Neave). Kasununu River.

The dorsal stripes of the thorax may be much more distinct than in Austen's figure, while the median triangular spots of the abdomen are often smaller.

T. nyasae is an East and Central African species, known from the Katanga, Northern Rhodesia, Southern Rhodesia, Nyasaland, and Portuguese East Africa. There is also a record from Northern Nigeria (Simpson, 1912, Bull. Ent. Res., II, p. 346), but I doubt whether it was based upon a correct identification. As for the specimens listed as *T. tarsalis* by Newstead, Dutton and Todd (1907, Ann. Trop. Med. Paras., I, p. 45, Pl. IV, fig. 13), they were made the types of *T. disjunctus* Ricardo (see under *T. ustus*).

Tabanus fraternus Macquart

Tabanus fraternus Macquart, 1845, 'Dipt. Exot.,' Suppl. I, p. 31 (♀; Caffraria). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 101, Pl. VIII, fig. 58 (♀).

Tabanus bipartitus Walker, 1856, 'Insecta Saundersiana,' I, Dipt., p. 451 (♀; Port Natal).

Tabanus trisignatus Loew, 1858, Öfvers. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 340 (♀; Caffraria).

Belgian Congo. — Kabalo, January 20, 1927; Luvungi, January 30, 1927.

This species is widely distributed in the Ethiopian Region, from Senegambia and Eritrea to the Cape Colony.

Tabanus sagittarius Macquart

Tabanus sagittarius Macquart, 1838, 'Dipt. Exot.,' I, 1, p. 123 (♀; Cape of Good Hope). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 92 and 105, Pl. II, fig. 14 (♀).

Tabanus variatus Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 64 (♀; without locality). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 105, Pl. VIII, fig. 59 (♀).

Tabanus serratus Loew, 1858, Öfvers. K. Vet. Ak. Förhandl., Stockholm, XIV, (1857), p. 340 ♀; Caffraria); 1860, 'Dipteren-Fauna Südafrikas,' I, p. 39, Pl. I, fig. 21 (♀).

Tabanus rubicundus Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 161 (♀; South Africa).

Tabanus exclamationis A. Girard, 1881, Jorn. Sci. Ac. Lisboa, VIII, No. XXXI, p. 228 (♀; Angola, between 10° S. and 13° S., and 16° E. and 19° E.).

Belgian Congo. — Elisabethville (Mich. Bequaert). Katanga (Valdonio). Uele River (J. Rodhain). Bolobo to Lukolela; Faradje (H. Lang and J. P. Chapin).

This species seems to occur throughout the Ethiopian Region. Many of the published records are probably based upon incorrect identifications.

Tabanus socius Walker

Tabanus socius Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 160 (♀; South Africa). Surcouf, 1909, 'Et. Monogr. Taban. Afrique,' pp. 92, and 104, Pl. II, fig. 13 (♀).

A number of records of *T. socius* have been published for the Belgian Congo and in a former paper I have referred to the species several specimens I had taken in the Katanga. One of these from Katobwe (near Bukama), and another from Lukonzolwa, are before me and appear to be true *T. socius*. Some of the other records may be due to wrong identifications. Moreover, I am in favor of Austen's view that *T. socius* is a mere form of *T. taeniola*. Surcouf's statements to the contrary are far from conclusive. It would seem that *T. socius* represents a variation transitional between *T. taeniola* Palisot de Beauvois (with more or less uniform median, abdominal stripe) and *T. sagittarius* Macquart (in which the stripe is replaced by a row of triangles).

In so far as one can rely on published records in this difficult group, *T. socius* is more or less typical of the savanna country, where it is widely distributed throughout the Ethiopian Region.

Tabanus taeniola Palisot de Beauvois

Tabanus taeniola Palisot de Beauvois, 1805–1821, 'Insectes Recueillis en Afrique et Amérique,' p. 56; Atlas, Pl. I (Dipt.), fig. 6 (♀; Oware and Benin, Southern Nigeria). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 102, Pl. VIII, fig. 61 (♀).

Tabanus guineensis Wiedemann, 1824, 'Analecta Entomologica,' p. 21 (♂; Guinea).

Tabanus subelongatus Macquart, 1845, 'Dipt. Exot.,' Suppl. I, p. 31 (♀; Caffraria).

Tabanus macrops Walker, 1848, 'List Dipt. Brit. Mus.,' I, p. 164 (♂; Egypt).

Tabanus longitudinalis Loew, 1852, Ber. Akad. Wiss. Berlin, p.658 (♀; Tette, Mozambique).

Tabanus dorsivitta Walker, 1854, 'List Dipt. Brit. Mus.,' V, Suppl. 1, p. 23 (♀; Gambia). Not *Tabanus dorsivitta* Walker, 1850.

Tabanus virgatus Austen, 1908, 'Second Rept. Wellcome Res. Lab. Khartoum,' p. 60, fig. 25 (♀; new name for *T. dorsivitta* Walker, 1854).

Tabanus subelongatus var. *proximus* Corti, 1895, Ann. Mus. Civ. Genova, XXXV, p. 132 (♀; Arussi Galla, Ganale Gudda, Abyssinia).

Liberia. — Monrovia, one female, July 1926. St. Paul's River, one female (O. F. Cook. — U.S.N.M.).

Belgian Congo. — Mistandungu; Kwamouth; Irebu; Nouvelle-Anvers; all on the Congo River, December 1926; Ukaturaka, October 1913; Boma; Mufungwa (Sampwe). Lisala; between Bolobo and Lukolela; Coquilhatville; Faradje; Garamba (H. Lang and J. P. Chapin). Bumba; Leopoldville (J. Rodhain). Bongo (J. Maes). Kitobola (Feller).

T. taeniola is widely distributed over the Ethiopian Region, from the Senegal and Upper Egypt to the Cape of Good Hope. It occurs in the rain forest as well as in the savanna.

Tabanus sugens Wiedemann (1828, 'Aussereurop. Zweifl. Insekten,' I, p. 140; ♀; Guinea) is an extremely doubtful species of the *T. lineola* group. In 1913 (Rev. Zool. Afric., II, p. 454), I referred to this species a female from Mufungwa (Sampwe), in Katanga. This specimen is now before me and after a careful study I have reached the conclusion that it is an aberrant specimen of *T. taeniola*. The antennae are wholly black.

Tabanus denshamii Austen

Tabanus denshamii Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 222 (♀; between Masindi and Murchison Falls, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 108, Pl. IX, fig. 64 (♀).

Belgian Congo. — Faradje, two females (H. Lang and J. P. Chapin).

This is a rare species, known from Kenya Colony, Uganda, the northeastern corner of the Belgian Congo, Katanga, Northern Rhodesia, and Nyasaland.

Tabanus principis, new species

Female. — Length, 15.5 mm.; width of head, 5 mm.; length of wing, 14 mm.

A medium-sized, black species, with small triangular spots of pale tomentum and glistening hairs in the middle of the tergites; legs dark clove-brown, with paler tibiae; fore tibiae glistening dirty white basally, but not ringed. Wings slightly and fairly uniformly smoky.

Head: frons and upper part of face (subcallus) pale russet pollinose, gradually passing into light gray pollinose in the lower part of the face; jowls gray pollinose, clothed with long silvery white hairs; the short, erect hairs of the frons black. Frons about six times as long as wide, scarcely narrowed toward the subcallus; the basal callosity elongate, widest at the base where it touches the eyes, gradually narrowed above where it ends rather abruptly, about twice as long as wide at the base; median callosity narrow, linear, reaching a little beyond the middle of the frons, connected with the lower callosity by a fine impressed line; a darker, dull hairy area on the vertex. Terminal segment of palpi swollen in the basal half, rather rapidly narrowed to the more slender, tapering, apical half; pale dirty yellow, covered with short, appressed, black pile and a few white hairs near the base below. Antenna of moderate length, brownish black, the third segment slightly reddish at base; first segment moderately large, not swollen, with black pile; second segment small, moderately produced at the upper apex, with black pile; third segment elongate crescent-shaped, rather broad at base where it bears a blunt upper projection, slender in the apical two-thirds. Eyes bare, uniformly dark purple in life. Thorax black, covered beneath, on the sides and above the base of the wing with a slate-gray pollen which also forms the beginning of two median bands at the anterior margin of the dorsum and some light spots at the transverse suture and near the scutellum; the pollen on the remainder of the dorsum dark brown; longer pilosity white on sternum and pleura; the postalar calli fringed behind with long white hairs; short pile black, mixed with a few glistening pale hairs on most of the dorsum and scutellum. Abdomen black, moderately shiny; dorsally covered with short, brownish black, appressed hairs mixed with a few yellowish hairs; extreme base of the first tergite and narrow middle line of the second to fifth tergites with a grayish, somewhat glistening pollen; this line widening into narrow triangles at the hind margins of the tergites which bear a few silvery or golden-yellow hairs; the small, median, triangular spots thus formed are visible on the first to fifth tergites and there is a trace of a similar median spot on the sixth; the hind corners of the tergites bear a few white hairs, but they do not form spots and are not connected with the median triangles. Ventrally the abdomen is clove brown in the middle with short black pile; along each side there is a rather well-defined, broad, grayish brown, longitudinal stripe, caused mostly by a gray tomentum on a reddish-brown ground color; hind margins of the sternites narrowly gray pollinose with a fringe of short, white hairs. Legs: coxae and femora black; the coxae with long white hair; the femora with shorter pile, mixed black and gray; knees and middle and hind tibiae dark clove brown, the short appressed pile of the tibiae black on the outer face, mostly glistening white on the inner face; fore tibiae not swollen, dirty yellow basally, dark clove brown apically, the basal two-thirds with many short, appressed, glistening white, and a few black hairs, the pile of the apical third black; under a handlens the base of the fore tibiae thus appears dirty yellow like the palpi, but it forms no conspicuous white ring; tarsi dark clove brown to black. Fore tarsi not dilated. Wings moderately and fairly uniformly smoky throughout, without clearer areas in any of the cells; slightly more brownish toward the anterior margin; stigma very elongate, pale brownish; veins dark clove brown; squamae uniformly smoky; halteres brown, with the apex of the knob dirty yellow. Fork of third longitudinal vein without appendix.

ISLAND OF PRINCIPE. — One female holotype, taken while attempting to bite man, on the shore of the bay of São Antonio, November 26, 1926.

T. principis is in general appearance somewhat like *T. obscurefumatus* Surcouf, but it is evidently not related to that species from which it is readily separated by the shape of the frontal calli and by the uniformly smoky wings. In Surcouf's classification it could be placed either in his ninth, tenth, or eleventh groups, although the total absence of lateral spots on the black dorsal side of the abdomen distinguishes it from all the species listed by Surcouf in these groups. If the shape of the frons and frontal calli is to be taken as a criterion, *T. principis* is perhaps allied to *T. ustus* Walker, with which, however, it cannot possibly be confused.

Thaumastocera Grünberg

Thaumastocera Grünberg, 1906, Zool. Anzeiger, XXX, p. 354. Monotypic for *Thaumastocera akwa* Grünberg, 1906.

Hybommia Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 348; 1925, *loc. cit.*, XI, 2, p. 340. Monotypic for *Hybommia nigripennis* Enderlein, 1922.

There can not be the slightest doubt that *Hybommia* is identical with *Thaumastocera*. All the generic characters given by Enderlein in 1925 perfectly fit the male of *T. akwa*. It is true that Enderlein places his new genus in his tribe Lepiselagini, characterized by "3. Fühlerglied oben ohne Ecke oder Zahn"; while *Thaumastocera* possesses a long tooth at the base of the third antennal segment. The author made, however, a mere guess as to the taxonomic position of his insect, since he states in the generic description, as well as in that of the type species: "Fühler abgebrochen."

Thaumastocera is known only from the rain forest of the West African Subregion. It is perhaps the most aberrant of all the Tabaninae, in which subfamily it must be placed owing to the absence of spurs on the hind tibiae. The proboscis is longer and more slender than usual, with long and rather narrow, chitinized labella, which, at any rate in the female, are nearly as long as the remainder of the labium. It is doubtful whether this proboscis is fit for biting and sucking blood. According to Grünberg's description and figures, the third antennal segment shows four divisions, three of them belonging to the style. As a matter of fact, in all three specimens of *T. akwa* before me (one female and two males), only three divisions can be made out, two of them forming the style; and Surcouf observed the same condition in his specimens. The antennae are inserted on a raised subcallus, separated by a depression from the much swollen face. The three ocelli are quite well developed. This latter character, however, is not unique in the Tabaninae, as Surcouf implies, for the North American genus *Merycomyia* Hine (a very valid genus overlooked or not recognized by both Surcouf and Enderlein) has the ocelli equally well developed.

I fail to see any close relationship between *Thaumastocera* and the South American genus *Stibasoma* Schiner, notwithstanding the toothed third antennal segment of both genera (which, moreover, is also found in *Acanthocera*). *Stibasoma* lacks the ocelli entirely and has five distinct divisions in the third antennal segment.

I can recognize but two species of *Thaumastocera: T. akwa* Grünberg and *T. nigripennis* (Enderlein).

Thaumastocera akwa Grünberg

Thaumastocera akwa Grünberg, 1906, Zool. Anzeiger, XXX, p. 356, figs. 7, 8, and 9 (♀ ♂; Johann-Albrechtshöhe and Lolodorf, Cameroon). Surcouf, 1921, 'Gen. Insect., Tabanidae,' p. 163, Pl. V, fig. 11*a-b* (♀ ♂).

Thaumastocera vittata Surcouf, 1923, Ann. Soc. Ent. France, XCI, 3, (1922), p. 241 (♂; Ivory Coast).

Belgian Congo. — Malela, in the estuary of the Congo River, one female, September 10, 1913. Stanleyville, one female and one male, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold, March 1915 (H. Lang and J. P. Chapin).

This species is West African, being known from Sierra Leone, the Ivory Coast, the Gold Coast, Southern Nigeria, Cameroon, Spanish Guinea, and the French and Belgian Congo.

The pair from Stanleyville agree well with Grünberg's original description of both sexes. The female is very fresh and shows the first two dorsal segments of the abdomen and the anterior half of the third broadly covered on the sides with grayish white pruinosity; the hind margin of the first segment bears in the middle a minute, pale brownish spot. The insect is otherwise coal black with black pilosity; the thorax with dark brown tomentum and two very narrow pale longitudinal lines, dilated at their tips, on the anterior half of the dorsum. The male shows no grayish pruinosity on the abdomen, but the median spot of pale brown on the first segment is more distinct and extends in a similar, larger, diffuse spot onto the base of the second; the last ventral segments are reddish brown; the thorax has two broad, yellowish brown, club-shaped stripes on the dorsum reaching from the anterior margin to the scutellum.

In the female from Stanleyville the infuscation of the wing is somewhat more extended than figured by Grünberg, the spots at the base of the second to fifth posterior cells being more or less fused with the smoky basal third and dark median cross-band, the latter being considerably wider than in Grünberg's figures; brown spots are present at the apex of second and upper branch of third, and at the forking of the third longitudinal vein; in the distal corner of the upper basal cell a round, dark brown spot is conspicuously set off. In the male, the markings of the wing are more as figured by Grünberg, but the fifth posterior cell lacks a dark spot in the base.

The males I have seen from the Belgian Congo fit the description of Surcouf's *T. vittata*, which I believe is identical with *T. akwa*. The author has failed to point out how the two are to be distinguished.

The eyes in life, as observed in the female from Malela, are uniformly colored, without bands or other markings.

Tribe Haematopotini

Haematopota Meigen

Haematopota Meigen, 1803, Illiger's Mag. f. Insectenk., II, p. 267. Monotypic for *Tabanus pluvialis* Linnaeus, 1758.

Chrysozona Meigen, 1800, 'Nouvelle Classification des Mouches,' p. 23 (without standing in nomenclature, since no species is mentioned). Hendel, 1908, Verh. Zool. Bot. Ges. Wien, LVIII, p. 53.

Holcoceria Grünberg, 1906, Zool. Anzeiger, XXX, p. 357. Monotypic for *Holcoceria nobilis* Grünberg, 1906.

Holococeria Ricardo, 1915, Arch. f. Naturgesch., LXXX, Abt. A, Heft 8, (1914), p. 128. Misspelling of *Holcoceria*.

Parhaematopota Grünberg, 1906, Zool. Anzeiger, XXX, p. 360. Monotypic for *Parhaematopota cognata* Grünberg, 1906.

Austenia Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 454. Monotypic for *Haematopota bullatifrons* Austen, 1908.

Potisa Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 454. Type by original designation: *Haematopota pachycera* Bigot, 1890.

Sterrhocera Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 350; 1925, *loc. cit.*, XI, 2, p. 402. Monotypic for *Sterrhocera pygmaea* Enderlein, 1922.

Tylopelma Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 350; 1925, *loc. cit.*, XI, 2, p. 339. Type by original designation: *Tylopelma patellicorne* Enderlein, 1922 = *Chrysozona ochracea* Bezzi, 1908.

Archiplatius Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 348; 1925, *loc. cit.*, XI, 2, p. 373. Type by original designation: *Tabanus trifarius* Macquart, 1838.

An interesting feature of these flies is the roof-like position which the wings assume in the living insect at rest, when they "meet together at the base and then diverge slightly, sloping somewhat like the roof of a house" (Austen).

Haematopota, though very widely distributed, appears to be mainly an Old-World type. In the New World, only three species are known from North America and the genus is entirely absent from tropical America; but it is represented in Argentina and Chile by a special subgenus, *Archiplatius*. The genus is unknown from Madagascar and the other islands of the Malagasy Region, as well as from Australia. On the African continent, however, it is unusually developed, since of over two hundred described species no less than one hundred and twenty-four are Ethiopian and several more African forms are as yet undescribed. Their number in Africa will certainly reach, if not surpass, that of the species of *Tabanus*.

As might be expected, these numerous species have invited a further subdivision of the genus; but, of the several generic or subgeneric names recently proposed for species of *Haematopota* in the broad sense, *Hippocentrum* alone appears to represent a natural subdivision worthy of generic rank.

The characters of the other proposed subdivisions of *Haematopota*, the names of which have been listed above, may be gathered from the subjoined synoptic key:

1. Third antennal segment composed of three divisions only, of which the basal one is ovate, disciform ...... *Sterrhocera.*
   Third antennal segment composed of five divisions. (South America) ...... *Archiplatius.*
   Third antennal segment composed of four divisions ...... 2.
2. Femora and tibiae, especially of hind legs, with dense fringes of long hairs; the hind tibiae more or less widened ...... *Austenia.*
   Femora and tibiae not conspicuously fringed ...... 3.
3. Basal division of third antennal segment broadly ovate, disciform ...... 4.
   Basal division of third antennal segment elongate or slender ...... 6.
4. Basal division of third antennal segment without a projecting edge along the upper side ...... *Potisa.*
   Basal division of third antennal segment with a median, bluntly projecting edge on the upper side ...... 5.
5. First antennal segment with a deep, transverse furrow or notch on the upper side before the apex ...... *Tylopelma.*
   First antennal segment without preapical notch or furrow, strongly raised at apex on the upper side ...... *Parhaematopota.*
6. Wings infuscated, with numerous, scattered spots, arranged more or less into "rosettes" ...... *Haematopota*, proper.
   Wings brownish black, only with a hyaline apical spot ...... *Holcoceria.*

Of these several divisions, *Austenia* is perhaps the only one representing a natural group. In tropical Africa it comprises: *H. bullatifrons* Austen, *H. ciliatipes* J. Bequaert, *H. daveyi* Austen, and *H. grahami* Austen; perhaps also *H. nigripennis* Austen and *H. niveipalpis* (Enderlein), both of which belong in *Tylopelma*, if one takes into account the shape of the first antennal segment. Some other species, however, such as *H. nobilis* (Grünberg), *H. decora* Walker, and *H. neavei* Austen, show a tendency toward the production of fringes on the legs. Of Oriental species, *H. cilipes* Bigot, *H. rubida* Ricardo, *H. singularis* Ricardo, and *H. lata* Ricardo appear to belong in *Austenia* and some of these species have the hind tibiae much more widened than any of the African forms.

Holcoceria was based upon the aberrant wing markings of the type species, *H. nobilis* Grünberg; but Austen (1914, Bull. Ent. Res., IV, p. 300) has described *H. nigripennis*, which is structurally like *H. nobilis*, but has a few light streaks and blotches in the wing, being transitional in this respect between *Holcoceria* and typical *Haematopota*. It does not seem that *Holcoceria* can be retained even as a subgenus.

The remaining names have been based upon peculiarities of the antennae.

Sterrhocera and *Archiplatius* being unknown to me, will not be discussed here. The characteristics of *Tylopelma*, *Potisa*, and *Parhaematopota* are obvious enough in the respective type species. If, however, one examines a large number of species, he finds within the genus *Haematopota* such a bewildering variety in the shape of the antennae, that it seems impossible to arrange all the species satisfactorily into the groups defined in the foregoing key. I, therefore, at present fully subscribe to Austen's statement that "no valid division of the genus *Haematopota*, at any rate into categories higher than groups or subgenera, is possible, since, although within the limits of the genus great differences exist in the shape of the frontal callus, antennae, front and hind tibiae, etc., it would be difficult to find two species showing identical differences from the genotype, yet all are united by the well-known, highly characteristic, and distinctive wing-markings, as well as by a general facies" (1912, Bull. Ent. Res., III, p. 405, footnote).

According to Enderlein's key, *Tylopelma* is based upon the combination of the disciform basal division of the third antennal segment with the presence of a transverse furrow before the apex of the first antennal segment. His generic diagnosis, however, says: "This genus differs from *Haematopota* Meigen, 1803, as follows: first antennal segment on the upper side with a sharp transverse furrow before the apex, forming a transverse swelling at the apex, which, seen from above and in profile, gives almost the impression of a distinct antennal segment." Unfortunately, Enderlein overlooked that this is precisely the structure of the first antennal segment in the genotype of *Haematopota*, *H. pluvialis* (Linnaeus); but in that species the basal division of the third segment is not disciform. The following African species have a more or less distinct notch before the apex of the first antennal segment: *H. decora* Walker, *H. angustipalpis* (Enderlein), *H. confluens* (Enderlein), *H. coronata* Austen, *H. fasciatapex* Edwards, *H. mactans* Austen, *H. ochracea* Bezzi (= *Tylopelma patellicorne* Enderlein), *H. fülleborni* (Enderlein), *H. nigripennis* Austen, *H. niveipalpis* (Enderlein), and *H. vittata* Loew (= *H. pulchrithorax* Austen). Not all of these, however, have a disciform basal division of the third antennal segment, while some have fringed legs and might equally well be placed in *Austenia*.

The following African species have a broad, disciform basal division of the third antennal segment and no furrow before the apex of the first: *H. brunnescens* Ricardo, *H. cognata* (Grünberg), *H. corsoni* Carter, *H. edax* Austen, *H. exiguicornuta* Carter, *H. harpax* Austen, *H. hastata* Austen, *H. ingluviosa* Austen, *H. pinguicornis* Carter, *H. rufula* (Surcouf), *H. sanguinaria* Austen, and probably also *H. lathami* Surcouf. Some of these, however, do not have the peculiar shape of the first antennal segment of *Parhaematopota cognata*. *H. harpax*, for instance, is plainly transitional to *Potisa*, although the basal division of the third antennal segment is somewhat angular above.

Potisa was entirely based upon the peculiar shape of the antennae, which Surcouf described as follows: "First antennal segment as long as the head, swollen from the base on, almost cylindrical; second segment very small, crescent-shaped; third segment with the basal division ovoid, swollen, slightly narrowed apically, rather suddenly ending in an appendage which is three times less wide and nearly five times less long and consists of the three terminal divisions, closely packed together." At first Surcouf included in it only two Indian species, *H. pachycera* Bigot and *H. rubida* Ricardo. Later he also referred to it *H. cilipes* Bigot, although this has the third antennal segment less swollen; but a specimen of that species, at the U. S. National Museum, shows that it could not possibly be placed in *Potisa:* the antennae are unusually long, the first segment being longer than the second and third together and a little incrassate in the basal half, while the basal division of the third is elongate, not at all disciform, and merges gradually in the three terminal divisions. On the other hand, *H. singularis* Ricardo, of Annam, which I have seen at the U. S. National Museum, has antennae like those of *H. pachycera.* Some other Oriental species, such as *H. lata* Ricardo, *H. splendens* Schuurmans-Stekhoven, and *H. confluens* Schuurmans-Stekhoven, form the passage between *Potisa* and the more usual type of *Haematopota.*

Obviously if the shape of the antennae of the Haematopotini were to be accorded more than specific value, many more generic or subgeneric names would have to be added to those proposed by Grünberg, Surcouf, and Enderlein.

Key to the Species of *Haematopota* of the Belgian Congo

It is very difficult to devise a satisfactory key to the many species of African *Haematopota,* several of which are quite closely allied or superficially alike. In the following attempt, I have covered thirty-two species of which I have had specimens before me and I have added *H. cruenta* from the description. I have not seen or not recognized in my material *H. pellucida* (Surcouf), *H. laverani* Surcouf, *H. brunnipennis* Ricardo, and *H. torquens* Austen, which I have not been able to include in my key from the descriptions alone. Their affinities will, however, be discussed in the sequel.

I have thought it advisable to mention as many characters as possible of each species and not merely to give a "skeleton key," as is now the fashion in entomological work. This is the more necessary because the territory covered possesses several additional species which have not yet been properly recognized and some of which may be undescribed. I have in my collection some half-dozen such unnamed species.

The key is entirely based upon females and should be used only for perfectly preserved specimens. The length is measured from the frontal callosity to the tip of the abdomen and does not include the antennae.

Haematopota vandenbrandeni was a manuscript name applied to a species of Sankisia, Katanga, which was found infected with an intestinal flagellate, *Crithidia tenuis* Rodhain, Pons, Vanden Branden, and J. Bequaert (1913, Bull. Soc. Path. Exot., VI, pp. 182–184). This species has never been described and, as specimens are no longer in existence, it should be eliminated from the list of African tabanids.

1. Femora and tibiae with dense, long hairs; those of the hind tibiae longer than the width of the tibia and forming a conspicuous fringe on the outer margin; tibiae wider than

usual. Frontal callosity prominent and shiny black, broadly separated from the eyes. Thorax conspicuously marked with grayish white, the scutellum wholly white. Wing divided near the middle into a basal, light part with few dark markings and an apical, dark part with few light markings. Length, 11 to 13 mm........ *H. ciliatipes.*

Femora and tibiae not densely fringed, the hairs at most as long as the width of the hind tibiae which are not wider than usual.. 2.

2. Middle and hind tibiae uniformly colored, without paler and darker rings. Basal division of third antennal segment not noticeably widened.............................. 3.

Middle and hind tibiae not uniformly colored, with paler and darker rings which are sometimes rather faintly marked (in doubtful cases, the basal division of the third antennal segment sometimes expanded).. 9.

3. Basal area of the wing clearer than the remainder; both basal cells either uniformly hyaline or subhyaline, or much more faintly mottled than the apical part............ 4.

Basal area of the wing not conspicuously clearer; both basal cells mottled dark and light like the remainder of the wing.. 7.

4. A large hyaline area in the wing beyond the stigma, reaching the costa; stigma and dark area below it faint, pale yellowish. Frontal callosity dirty yellowish brown. First antennal segment straight, slightly and uniformly thickened throughout, longer than half the width of the vertex and about as long as the basal division of the third segment. Length, 8.5 to 9 mm.................................... *H. masseyi.*

No such large hyaline area in the wing; the clear spot beyond the stigma either faint, or rounded and usually darkened in the center, or reduced to two small streaks; stigma conspicuously darkened. First antennal segment somewhat curved and more swollen on the inner side, at most as long as half the width of the vertex, and shorter than the basal division of the third segment.. 5.

5. Basal cells and discal cell distinctly, though faintly mottled dark and light, the contrast between the clear base and dark apex of the wing less pronounced. Frontal callosity shiny black, the spot between the insertions of the antennae also black. First antennal segment very slightly swollen, about two and one-half times as long as its greatest width seen from above and about the length of the terminal three divisions of the third segment together. Length, 9 to 11 mm..................... *H. similis.*

Basal cells and discal cell uniformly colored, the contrast between the clear base and dark apex of the wing quite marked. First antennal segment more swollen, not quite twice as long as its greatest width seen from above and shorter than the terminal three divisions of the third segment together... 6.

6. Two basal cells, discal cell and proximal half of first posterior cell yellowish, somewhat clouded; the costal cell of the same color. Frontal callosity shiny black; a black spot below it, between the insertions of the antennae. Length, 9.5 to 11.5 mm. *H. denshamii.*

Two basal cells, discal cell and proximal half of first posterior cell almost clear hyaline; the costal cell conspicuously darker. Frontal callosity pale brownish to blackish; the median spot below it yellowish brown. Length, 9.5 to 11 mm...... *H. copemanii.*

7. Apical clear streak of wing bifurcate in the first submarginal cell. First antennal segment short, hardly longer than half the width of the vertex. Length, 6.5 to 10 mm. Darker species, with dark brown legs.............................. *H. perturbans.*

Apical clear streak of the wing not bifurcate in the first submarginal cell. Lighter colored species, with pale yellowish-brown legs.................................... 8.

8. Basal division of third antennal segment about one-third longer than the first segment; its apical division as long as or slightly longer than the preceding two divisions taken together. Second submarginal cell as a rule with an additional, much fainter, light streak in the apical portion (running from the extremity of the lower branch of the third longitudinal vein). Length, 7 to 10 mm........................ *H. pertinens.*

Basal division of third antennal segment scarcely longer than the first segment; its apical division much shorter than the preceding two divisions taken together (often about the length of the third division). Second submarginal cell without additional streak at the extremity of the lower branch of the third longitudinal vein. Length, 10 to 10.5 mm.. *H. duttoni.*

9. All tibiae with a narrow, indistinct, pale brown ring close to the base; middle tibiae with a second, pale brown, indistinct ring below the middle; basal segment of middle and

hind tarsi conspicuously creamy white. Frons very broad, wider at the vertex than one eye. First antennal segment slender, much longer than half the width of the vertex; basal division of third segment elliptical. Length, 6 to 6.5 mm.... *H. vexans.*

Tibiae either with more distinct rings, or with two rings to the hind tibiae; or the basal segments of the tarsi not conspicuously whiter than the rings of the tibiae........ 10.

10. Hind tibiae with *one* conspicuous pale ring close to the base; rarely with a fainter preapical pale spot or ring.. 11.

Hind tibiae with *two* equally distinct or equally faint pale rings...................... 18.

11. Antennae very long, black; first segment as long as the width of the vertex, strongly swollen throughout, fairly uniformly so when seen from above, but in profile conspicuously humped in its apical third dorsally and with a deep preapical transverse depression; basal division of third segment slender, slightly broader basally, a little shorter than the first segment and less than three times the length of the apical three divisions together. Frontal callosity black, occupying nearly one-third of the length of the frons, broadly touching the eyes, very prominent and divided lengthwise by a saddle-like depression. Basal white rings of the tibiae very broad, the middle tibiae also with a preapical white ring; tarsi black, the middle and hind basitarsi rather obscurely dirty white at the base; fore tarsi much broader than usual; femora and tibiae with long hairs, those on the outer margin of the hind tibiae forming a dense fringe, which is much shorter than the width of the tibiae. Wing with relatively few pale blotches, forming no rosettes; discal cell with two hyaline cross-stripes; first submarginal cell with two basal blotches, a preapical curved streak entering the second submarginal, a sinuate streak basad of the appendix (connected with a large hyaline spot of the marginal cell, beyond the stigma), and two small spots apicad of the appendix. Large, blackish species; dorsum of the thorax with a few conspicuous grayish-white markings. Length, 12 mm.......................... *H. nigripennis.*

Antennae of a different shape; the first segment not humped in the apical third; when a transverse preapical depression is present (as in *H. decora*), the antennae are much shorter and the pale blotches of the wing are more numerous.................... 12.

12. Large species, 10 to 12.5 mm. in length. Hind tibiae often with a second, faintly indicated, paler spot before the apex. First antennal segment about as long as, or only a little shorter than the width of the vertex, without preapical transverse depression; basal division of the third segment narrow, slightly produced dorsally near the base. Frontal callosity large, occupying one-third of the length of the frons............. 13.

As a rule smaller species; when over 10 mm. in length, the above combination of characters is not present.. 14.

13. Mummy brown to blackish brown species, with the hind borders of the abdominal tergites narrowly gray pollinose; dorsum of thorax with distinct, narrow, yellowish-gray, longitudinal stripes. Fore tibiae distinctly swollen, slightly wider than the femora. Third antennal segment slightly wider, its basal division distinctly less than twice the length of the terminal three divisions together. Pale blotches of wing more conspicuous, the three rosettes more distinct; a wide, hyaline half-circle (connected with a large spot of the marginal cell, apicad of the short stigma) in the first submarginal cell (above the appendix); rosette at the apex of the discal call consisting of four ring-like spots.. *H. neavei.*

Paler, yellowish-brown species, with the abdomen more uniformly pale brown dorsally and the dorsum of the thorax only faintly striped. Fore tibiae scarcely swollen, hardly wider than the femora. Third antennal segment more slender, its basal division a little over twice the length of the terminal three divisions together. Pale blotches of wing much less conspicuous, the rosettes indistinct; a narrow hyaline cross-streak apicad and basad of the appendix in the first submarginal cell; stigma long, followed by a rather indistinct pale spot; rosette at the apex of the discal cell consisting of simple, curved streaks.. *H. inornata.*

14. First antennal segment much swollen, not more than twice as long as thick seen from above, and only a little longer than half the width of the vertex; dorsally with a slight transverse depression before the apex; basal division of third segment moderrately widened, elongate elliptical, about as long as the first segment. Length, 7 to 10 mm.. *H. decora.*

First antennal segment slender or, if swollen, more than twice as long as thick seen from above. Frons narrower, not as broad as long.................................. 15.

15. Clove-brown; dorsum of abdomen with hind margins of segments and a double series of spots gray. Frontal callus large, black. Dorsum of thorax with faint indications of longitudinal gray stripes anteriorly, the hind margin and base of scutellum light gray. Basal segment of middle and hind tarsi conspicuously creamy white at base. Length, 9 mm.. *H. cruenta.*

Basal segment of middle and hind tarsi faintly paler at base, not with a conspicuous creamy white ring.. 16.

16. Wing strongly infuscate, with relatively few, small, much scattered hyaline spots; second basal cell with two narrow streaks; apical streak rather broad, but ending in the second submarginal cell far from the hind margin. First antennal segment very slender, about as long as the elongate basal division of the third segment; the latter distinctly expanded near the base. Length, 10 mm.................. *H. schoutedeni.*

Wing much more abundantly blotched with hyaline spots; second basal cell with four hyaline spots forming two incomplete rings.................................. 17.

17. Hyaline blotches in the wing distinctly grouped into three rosettes, around the apex of the second basal cell, the apex of the discal cell, and the fork of the third longitudinal vein; apical streak ending in the second submarginal cell far from the hind margin. Basal division of third antennal segment moderately and almost uniformly thick throughout, slightly longer than the first segment. Frons with elongate, lateral, velvety spots and a small, median, velvety dot. Length, 9.5 to 10 mm. *H. partifascia.*

Hyaline blotches in the wing more uniformly scattered, not forming conspicuous rosettes; apical streak broad and, as a rule, continuing to the hind margin. Basal division of third antennal segment moderately thick, but distinctly widened in the basal half, about as long as the first segment. Frons with rounded, velvety spots on the sides, without median dot. Length, 8 to 9.5 mm........................ *H. insatiabilis.*

18. First antennal segment rather long and thick, with a conspicuous transverse depression or deep notch on the upper side, dividing the apical portion........................ 19.

First antennal segment without constriction or notch before the apex................ 21.

19. Face mostly covered with gray pollinosity, sometimes with a small, velvety, dark spot near the eye on each side. Frons about as wide as long, with two small, rounded, velvety, lateral spots and a median, velvety, much smaller spot. Basal division of third antennal segment rather slender, slightly shorter than the first segment, about twice as long as its greatest width which is at the basal third. Fore tibiae with the basal half conspicuously white. Tip of wing with a faint clear blotch beyond the preapical streak. Length, 9.5 to 11 mm.................................. *H. mactans.*

Lower part of face covered with gray pollinosity, sharply contrasting with an upper, darker, more or less velvety, transverse band. Basal white rings of tibiae narrower and less conspicuous. Tip of wing only with the preapical clear streak........... 20.

20. Dark brown, with dark brown to black legs and antennae. Antennae rather short; the basal division of the third segment broadly elliptical, at most one and one-half times as long as wide and much shorter than the first segment. Length, 8 to 9 mm.. *H. vittata.*

Paler yellowish-brown, with the antennae and legs much of the same color. Antennae rather long; the basal division of the third segment narrowly elliptical, nearly twice as long as its greatest width and shorter than the first segment. Length, 10 to 11.5 mm.. *H. ochracea.*

21. Transverse diameter of the head unusually long; frons wider than long and distinctly narrowed toward the vertex, with only two transverse, velvety spots in its lower half. First antennal segment very short, less than twice as long as wide, but not much swollen; basal division of third segment narrowly elliptical, about the length of the first segment. Abdomen broad, with rows of conspicuous spots. Length, 7.5 to 9 mm.. *H. hirta.*

Frons narrower or with parallel or subparallel sides. Antennae not unusually short.... 22.

22. Body extremely *Tabanus*-like. Abdomen dorsally with conspicuous, lateral, gray spots which are connected with the gray anterior margins of the tergites; their sides and hind margins also gray. Frons longer than wide, with three small, velvety spots.

Antennae wholly pale yellowish; first segment short, not quite twice as long as wide at apex, not much swollen; basal division of third segment elongate, widened and somewhat angular above at the base, much longer than the first segment. Wing slightly smoky, with faint hyaline spots. Length, 11 mm. . . . . *H. tabanula.*

Body not *Tabanus*-like and not conspicuously marked as described above; or else the frons at least as broad as long or the antennae of a different shape. . . . . 23.

23. Legs with many long, stiff bristles, especially marked on the fore and middle tarsi. Antennae long; first segment very slightly swollen, about two and one-half times as long as its greatest width as seen from above; basal division of third segment elongate-oval, more than twice as long as wide and about as long as the first segment. Frons slightly longer than wide at vertex, where it is very little narrower than at the basal callosity; with only two large, rounded, velvety, lateral spots. Length, 9 mm. . . . . *H. hirsutitarsus.*

Tarsi not unusually bristly. . . . . 24.

24. First antennal segment slender, not or scarcely swollen, about three times as long as wide at apex as seen from above; basal division of third segment slender or elongate-ovate. . . . . 25.

First antennal segment short or more or less distinctly swollen, about twice as long as wide at apex or very little more as seen from above. . . . . 27.

25. Frons rather narrow, over one and one-half times as long as wide at vertex and distinctly narrowed above; with a long, semi-elliptical, black, basal callosity which is far removed from the eyes; and with two large, velvety, lateral spots and one minute, velvety dot in the middle of the vertex. Basal division of third antennal segment about as long as the first segment, much wider near the base than at the apex. Apical clear streak of wing not reaching hind margin. Abdominal gray spots small. Length, 9 to 10 mm. . . . . *H. angustifrons.*

Frons broader, less than one and one-half times as long as wide at vertex; the basal callosity paler and transverse. Abdominal gray spots large. . . . . 26.

26. Frons slightly longer than wide at vertex, where it is very little narrower than above the antennae; with only two large, rounded, velvety, lateral spots; basal callosity long, extending over the lower third of the frons, widened in the middle, very broadly touching the eyes on the sides. Basal division of third antennal segment longer than the first segment, slender and of almost uniform width throughout. Apical clear streak of wing reaching close to the hind margin. The basal ring of the hind tibiae much wider than the apical one. Length, 10 mm. . . . . *H. divisapex.*

Frons about as long as wide at vertex, where it is very little narrower than above the antennae; with two large, velvety, lateral spots and often with a median, black dot at the vertex; basal callosity short, covering about the lower fourth of the frons and notched in the middle by an extension of the gray pollinosity of the frons, rather narrowly touching the eyes in the lower corners. Basal division of third segment about as long as the first segment, slender, but much wider near the base than at the apex. Apical clear streak of wing not reaching hind margin. The two pale rings of the tibiae of about equal width. Length, 9 mm. . . . . *H. stimulans.*

27. Basal division of third antennal segment much widened, disciform, less than twice as long as wide. . . . . 28.

Basal division of third antennal segment elongate-ovate, at least twice as long as its greatest width. . . . . 30.

28. First antennal segment large and swollen throughout, a little over one and one-half times as long as wide in profile; both the upper and lower apices of the second segment strongly produced; third segment conspicuously flattened throughout, the basal division about as long as the first segment, the second and third divisions more than twice as wide as long. Large, dark clove-brown to black species; the abdomen without distinct lateral spots. Wing strongly infuscated, with conspicuous clear markings forming distinct rosettes. Length, 9.5 to 11.5 mm. . . . . *H. harpax.*

First antennal segment small, more swollen toward the apex; only the upper apex of the second segment slightly produced; basal division only of the third segment conspicuously flattened, the second and third divisions not twice as wide as long. Smaller, pale colored species. . . . . 29.

29. Frons rather narrow, a little less than twice as long as wide at the vertex, where it is distinctly narrower than above the antennae; basal callosity long, occupying a little less than one-third of the frons, semi-elliptical and not touching the eyes; frons with only two rather small, velvety, lateral spots. First antennal segment small, only slightly more swollen toward the apex which is not conspicuously humped above; basal division of third segment very wide. Body mostly pale yellowish, darker toward the apex of the abdomen, which bears very faint, lateral, gray spots; pale rings of the tibiae rather faint. Wing moderately infuscated, with few pale markings not forming distinct rosettes. Length, 8 mm. . . . . *H. rufula.*

Frons wider, about one and one-half times as long as wide at vertex, where it is scarcely narrower than above the antennae; basal callosity short, occupying only one-fourth of the frons, transverse and broadly contiguous to the eyes; frons with two rounded, velvety, lateral spots and a smaller, median spot far below the vertex. First antennal segment strongly swollen above in profile, and somewhat humped in the apical portion; basal division of third segment moderately wide. Body brownish yellow; the abdomen with a median, gray stripe and two rows of conspicuous gray spots; pale rings of tibiae distinct. Wing faintly smoky, the few pale markings not forming distinct rosettes. Length, 10 mm. . . . . *H. brunnescens.*

30. Frons rather narrow and nearly parallel-sided, slightly over one and one-half times as long as wide at vertex; basal callosity very long, occupying about one-fourth of the frons, rectangular and broadly contiguous to the eyes; velvety, lateral spots placed about midway on the frons. First antennal segment very gradually swollen toward the apex in profile, about twice as long as thick. Body mummy-brown; the distal portion of the scutellum conspicuously paler ochraceous buff; the abdomen with two rows of large, gray spots; face gray throughout. Wing slightly smoky, with rather inconspicuous light markings not forming distinct rosettes and much broken up into spots. Length, 8 to 9 mm. . . . . *H. sanguinaria.*

Frons much wider; either nearly as wide at vertex as long or distinctly narrowed toward the vertex. . . . . 31.

31. Frons distinctly narrowed toward the vertex. Face uniformly gray throughout. Antennae black. . . . . 32.

Frons nearly parallel-sided. . . . . 33.

32. First antennal segment short, only very little swollen, black, covered with dull gray pollinosity; basal division of third segment slender, a little wider basally, much longer than the first segment; the last division shorter than the two preceding ones together. Frontal callosity short, hardly one-fourth the length of the frons, transverse and broadly contiguous to the eyes; frons with two large, rounded, velvety, lateral spots. Pale rings of tibiae indistinct. Body black, with gray pollinosity; the abdomen without spots. Wing moderately infuscated; the clear spots larger than usual, covering most of the discal cell. Length, 9 to 11 mm. . . . . *H. similis.*

First antennal segment conspicuously swollen, shiny black; basal division of third segment more stubby, about as long as the first segment and conspicuously wider near the base; the last division about as long as the two preceding ones together. Frontal callosity very prominent, occupying about one-third of the frons, semi-elliptical and broadly contiguous to the eyes; frons with two large, more or less crescent-shaped, velvety, lateral spots and with a more or less distinct, smaller median dot at the vertex. Pale rings of tibiae distinct. Body black, the abdomen with two broad, but rather faint, longitudinal, gray stripes and narrow, gray margins to the tergites. Wing strongly infuscated; the clear spots narrow and forming three distinct rosettes around the apex of the second basal cell, the apex of the discal cell, and the fork of the third longitudinal vein. Length, 8.5 to 10 mm. . . . . *H. furva.*

33. Antennae black; the first segment conspicuously swollen, shiny; basal division of third segment about the length of the first segment, rather wider than usual. Frons with three large, velvety spots, two lateral ones and one median. Abdomen with rather faint gray spots. Wing moderately infuscated, with clear spots forming three distinct rosettes around the apex of the second basal cell, the apex of the discal cell, and the fork of the third longitudinal vein. Length, 10 mm. . . . . *H. tumidicornis.*

Antennae extensively dirty yellowish; the first segment small, only very little swollen, rather dull; basal division of third segment much longer than the first segment. Frons with only two, small, velvety, lateral spots; the basal callosity dirty yellowish, long, occupying nearly one-third of the frons, rectangular and broadly contiguous to the eyes. Abdomen with two rows of large, conspicuous, gray spots almost forming two stripes. Wing very slightly smoky, with rather small and much scattered clear spots, not forming conspicuous rosettes. Length, 10 mm................ *H. noxialis.*

Haematopota ciliatipes, new species

Female. — Length, 11 to 13 mm.; width of head, 4 to 4.5 mm.; width of frons at vertex, a little over 1 mm.; length of wing, 10 to 11 mm.

A dark colored, unusually large species. Wing divided near middle into a basal, light part with few dark markings and an apical, dark part with few light markings. Hind tibiae distinctly ciliate; antennae long, rather slender; frontal callosity large, shiny black and strongly convex dorsally. Space between the antennae and reaching down onto the face deep velvety black. Frontal spots and two spots on the face between the eyes and antennae, one on each side, velvety black.

Head: frons wide, wider below than at vertex, gray pollinose and mostly black pilose; median frontal spot minute; lateral frontal spots of medium size, distinctly separated from the eyes and the frontal callosity. Frontal callosity prominent, shiny black, semicircular in outline with the upper convexity distinctly separated from the eyes. Face largely white pollinose and hairy; a three-sided velvety black spot in contact with each eye at the level of the antennae, and a black marking on upper middle and extending between the antennae to join the frontal callosity; this latter marking is truncate below and equal in width to the distance between the antennae at their insertions. First segment of the antenna scarcely enlarged, somewhat larger at apex than at base; basal part reddish yellow, apex and entire second segment black and black hairy; third segment elongate, slender, widest near base and gradually narrowed toward apex, narrowly pale basally, otherwise blackish on the outer side, usually somewhat paler on the inner side. Palpi fuscous, not much enlarged, distinctly shorter than the proboscis. Thorax nearly black above; three gray stripes before the transverse suture, mid-dorsal one very narrow and scarcely evident, lateral ones wider and distinct, each followed behind the transverse suture by a distinct small triangular spot; dorsum behind the transverse suture with four gray stripes all widened behind; scutellum with narrow brown base, otherwise white; sides and venter of thorax white pollinose and white hairy. Abdomen black, with the lateral and posterior margin of each segment gray pollinose; second segment with narrow anterior margin, wide lateral margins, mid-dorsal area and rather wide posterior margin, gray; third similar to second, but the gray is less extensive; venter entirely gray pollinose. Legs: fore tibiae white basally; otherwise fore legs dark and long hairy; middle femora pale brownish; middle tibiae light and dark banded, with a light band near the base and another beyond the middle, the light bands wider than the dark ones; hind femora colored like the middle ones, with long white hairs, except at apex where there is a tuft of black hairs; hind tibiae distinctly but moderately widened, flat, uniformly blackish brown, without spots, long ciliate for their entire length, especially on the outer margin, the hairs pale basally and over part of the anterior surface, black over apical four-fifths; all the tarsi dark, nearly black. Wing: basal half as far as the stigma mostly light with mottled dark markings, especially in the basal cells, the axillary cell more extensively dark; apical half dark with light markings, the black stigma large and long but less conspicuous than usual; the two halves in rather sharp contrast; the light markings few, not forming rosettes, mostly small and drop-shaped, a much larger spot in the apical third of the first posterior cell and a streak across the first submarginal cell (a little before the appendix) connected with a spot in the marginal cell (beyond the stigma); preapical streak narrow, short, and broken up into three drop-like spots. Squamae brown, border dark brown. Halteres: knobs brown, stalks brownish yellow.

BELGIAN CONGO. — Kikwit, October 1920, one female holotype and five female paratypes (H. Vanderyst. — Congo Museum, Tervueren). Dumbi (Kasai), October 6, 1921, one female paratype (H. Schouteden. — Congo Museum, Tervueren). Kondue, one female paratype (E. Luja. — Congo Museum, Tervueren). Luebo, one female paratype (D. W. Snyder. — U. S. Nat. Mus.) and one female paratype (H. Schouteden. — Congo Museum, Tervueren).

Kimpako to Sanda, one female paratype (H. Vanderyst. — Congo Museum, Tervueren). Semliki Valley, September 10, 1913, one female paratype (C. Christy. — Congo Museum, Tervueren). Aruwimi River, two female paratypes (U. S. Nat. Mus.). Uele River, one female paratype (J. Rodhain). Avakubi, October 4, 1909, one female paratype (H. Lang and J. P. Chapin). Tete (between Penge and Irumu), February 22, 1914, one female paratype. Lubutu, January 20 and 29, 1915, five female paratypes.

This species belongs in the group for which Surcouf has erected the genus or subgenus *Austenia*. It is easily distinguished from *H. grahami* Austen and *H. daveyi* Austen by having the frontal callosity quite widely separated from and not nearly touching the eyes and in lacking the conspicuous creamy-white band at the base of the hind tibiae. From *H. bullatifrons* Austen (1908, Ann. Mag. Nat. Hist., (8) I, p. 407, ♀; 1909, 'Illustr. African Blood-Suck. Flies,' p. 127, Pl. XI, fig. 87), with which it has probably been confused thus far, *H. ciliatipes* differs, *inter alia,* in the peculiar color scheme of the wing (especially in the distinct contrast in color of the basal and apical halves and in the absence of a circular rosette at the apex of the discal cell), in the different shape of the antennae, as well as in the absence of the pair of buff-colored spots on the hind tibiae. I have compared the type of *H. ciliatipes* with that of *H. bullatifrons* at the British Museum. Originally described from Northern Nigeria, *H. bullatifrons* has also been recorded from the Gold Coast and French Guinea, so that its occurrence in Liberia is most probable.

Haematopota masseyi Austen

Haematopota masseyi Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 97 (♀; Lualaba River, between 9° S. and 10° 40′ S., Belgian Congo).

BELGIAN CONGO. — Ngombe (Kasai) (H. Schouteden). Leverville (mid-Kwilu) (H. Vanderyst). Lubefu.

The above specimens, six females in all, differ from both *H. denshamii* Austen and *H. copemanii* Austen as indicated in the key. The female from Lubefu was seen by Surcouf, who referred it doubtfully to his *H. laverani.*

This species is known only from Northern Rhodesia and the Katanga and Kasai districts of the Belgian Congo.

Haematopota laverani Surcouf

Haematopota laverani Surcouf, 1907, Bull. Mus. Hist. Nat. Paris, XIII, p. 421 (♀; Kabinda, Belgian Congo).

This species is known only from the type locality, which is in the Katanga District of the Belgian Congo. I have not seen it. According to Austen (1908), *H. copemanii* is distinguished from *H. laverani* "by the frontal callus being slightly shallower on each side of the middle line, the light area in the wings and the light wing-markings being more hyaline, the first and second costal cells being darker, and the stigma being distinctly longer and darker."

Haematopota similis Ricardo

Haematopota similis Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 101 and 112, Pl. IV, fig. 13 (♀; Uganda). Neave, 1912, Bull. Ent. Res., III, pp. 288, 320, and 322, Pl. XI, fig. 2 (♂).

Belgian Congo. — Valley of the Mungofwe, February 19, 1916 (J. Rodhain). Kamaniola, February 1, 1927, numerous males and females; the males were all taken resting on blades of grass in the short grass savanna, in the early morning (about 7 a.m.). Luvungi, January 30, 1927. Kundelungu Plateau, December 19, 1912.

H. similis and the closely allied *H. unicolor* Ricardo form the transition from the species with markedly paler basal area of the wing to those in which the wing is more uniformly mottled. The contrast between the two areas of the wing is even less marked in the male than in the female. The extent of the dark markings of the first abdominal tergites varies considerably in the series of males I have taken at Kamaniola, but they are never as much reduced as in the male of *H. unicolor*.

H. similis is known only from Uganda (where it is common), the Nyanza Province of Kenya Colony, the eastern borderland of the Belgian Congo, and Katanga.

Owing to the very faint pale rings of the hind tibiae, this species has been inserted twice in the key.

Haematopota copemanii Austen

Haematopota copemanii Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 94 (♀; Kasempa District, Northwest Rhodesia).
Chrysozona copemanii J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 467, fig. 16 (♀).

Belgian Congo. — Kawewe (north of Kayoyo), December 14, 1911 (J. Rodhain). Kipochi (on the Luapula River), February 16, 1912.

This species is known from Northern Rhodesia and the Katanga District of the Belgian Congo.

Haematopota denshamii Austen

Haematopota denshamii Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 220 (♀; Nimule to Wadelai, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 126, Pl. XI, fig. 85 (♀). Neave, 1912, Bull. Ent. Res., III, pp. 288, 320, and 322, Pl. XI, fig. 1 (♀ ♂).

Belgian Congo. — Garamba; Faradje; Pawa (H. Lang and J. P. Chapin). Amadis; Limbala, August 8, 1913; Likati, June 1913; between Amadis and Bambili; Aba (J. Rodhain). Watsa to Niangara (L. Burgeon). Albertville (R. Mayné). Kunungu, April 1921; Luebo, September 1921 (H. Schouteden). The foregoing records are all based upon females. I have also seen a male from Aba, April 1925 (H. Schouteden).

Tanganyika Territory. — Kigoma (R. Mayné).

This species is known from the Anglo-Egyptian Sudan, the Belgian Congo, Uganda, Kenya Colony (western part), Tanganyika Territory, and Angola.

Haematopota pellucida (Surcouf)

Chrysozona pellucida Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 457 (♀; Leopoldville, Belgian Congo).

The description of this species does not allow of its separation from *H. denshamii* Austen, of which I am inclined to regard it as a synonym.

In addition to its occurrence in the Belgian Congo, *H. pellucida* has been recorded from northern Angola (Gamble, 1914, Jl. Trop. Med. Hyg., XVII, p. 149). Neave (1912, Bull. Ent. Res., III, p. 315) includes it in the list of the blood-sucking insects of Nyasaland, but he does not mention it in his later paper on the Tabanidae of that territory and I rather doubt its occurrence there.

Haematopota perturbans Edwards

Haematopota perturbans Edwards, 1916, Bull. Ent. Res., VII, p. 158, fig. 10, Pl. II, fig. 2 (♀; Zambi, Belgian Congo).

Belgian Congo. — Tshela (Mayumbe), March 8, 1924 (A. Collart). Lemba (Mayumbe), December 1, 1915 (R. Mayné). Temvo (Mayumbe), March 1922 (H. Schouteden).

H. perturbans, of which I have seen one of the paratypes from Zambi, differs conspicuously from both *H. duttoni* Newstead and *H. pertinens* Austen in the markings of the body: it is pale yellowish-brown without the olive-gray pollinosity of the other two species; the dorsum of the thorax has five narrow, grayish-white, longitudinal stripes; all the abdominal tergites are narrowly margined with grayish-white, but are without discal blotches.

This species is known only from the Lower Congo District of the Belgian Congo where it seems to be one of the more common tabanids. Edwards has also recorded it from the "Upper Lubingo," but I have been unable to locate a river of that name on any of the maps I have seen.

Haematopota brunnipennis Ricardo

Haematopota brunnipennis Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 101 and 111, Pl. IV, fig. 11 (♀; Salisbury, Southern Rhodesia). Newstead, Dutton and Todd, 1907, Ann. Trop. Med. Paras., I, p. 43.

Newstead has recorded this species from the central Belgian Congo (Coquilhatville, Nyangwe, and Kasongo), which is somewhat surprising in view of the fact that it is known otherwise only from Nyasaland, Southern Rhodesia, and Benguela. I have not seen it.

According to the description, *H. brunnipennis* is closely allied to *H. pertinens* Austen and *H. duttoni* Newstead, but differs from both in having the stigma of the wing long, prominent, and followed by a semicircular, clear spot.

Haematopota duttoni Newstead

Haematopota duttoni Newstead, 1907, Ann. Trop. Med. Paras., I, p. 41, Pl. IV, fig. 3 (♀; Nyangwe; Kasongo; Tschofa; Miambwe; all in the Belgian Congo).
Chrysozona duttoni J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 467, fig. 15 (♀).

This species is known only from the Belgian Congo, where it is by no means rare. Of the specimens which I have recorded in 1913 under the name *H. duttoni*, I feel certain that those of Kasongo, the Lufubu River, and Kibombo were correctly identified. The other specimens, from Katanga, probably all belonged to *H. pertinens* Austen, as shown in the discussion of that species. The figure which I have given of the antenna is that of the true *H. duttoni*.

Haematopota pertinens Austen

Haematopota pertinens Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 423 (♀; twenty-four miles from Blantyre, Nyasaland). Surcouf, 1912, Bull. Mus. Hist. Nat. Paris, XVIII, p. 145 (♀).

Belgian Congo. — Mufungwa (Sampwe), December 16, 1911. Elisabethville, January (C. Seydel; Mich. Bequaert; Valdonio). Kongolo, December (Mich. Bequaert).

The specimen from Mufungwa was listed by me in a former paper (1913, Rev. Zool. Afric., II, 3, p. 467) as *H. duttoni* Newstead; but a careful comparison with a specimen of *H. pertinens*, from Nyasaland (identified by Austen), leaves no doubt that it belongs to the latter. Possibly all the other specimens from Katanga (Kilwa, Songa, and Lukonzolwa) recorded in the paper mentioned were likewise *H. pertinens*.

Moreover, I am by no means certain that *H. pertinens* is a valid species. I have before me a specimen taken at Kasongo which, in the shape of the antennae, is intermediate between *H. duttoni* and *H. pertinens*. It agrees with *pertinens* in having the basal division of the third segment much longer than the first segment; but the apical division is considerably shorter than the two preceding divisions taken together. This specimen has also a trace of an additional light streak in the apex of the second submarginal cell.

Surcouf (1912) has referred to *H. pertinens* specimens from 345 kilometers south of Kindu (on the railroad to Kongolo) and from Leopoldville. I have not seen these specimens.

H. pertinens appears to be widely distributed in the savannas of tropical Africa. It is known from Northern Nigeria, the Belgian Congo, Northern and Southern Rhodesia, Nyasaland, and Portuguese East Africa.

Haematopota vexans Austen

Haematopota vexans Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 412 (♀; Belgian Congo).

The more definite locality of the type specimens is unfortunately not known.

Belgian Congo. — I refer to this species a female taken on the Lupwezi River in the Katanga District, by Dr. J. Rodhain. I have, however, not been able to compare it with the type.

The basal, pale ring of the hind tibiae is very faint and might easily be overlooked.

Haematopota inornata Austen

Haematopota inornata Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 103 (♀; Buddu, Uganda); 1926, Ark. f. Zool., XVIII B, No. 6, p. 1 (♀).

This species has been found thus far in Uganda (Buddu and Mpanga Forests) and in the Uele and Ituri districts of the Belgian Congo (not in "Tanganyika Territory" as given by Austen, 1926).

Belgian Congo. — Amadis to Bambili; Uere River (J. Rodhain). Lesse, July 21, 1914. Moto, 1920 (L. Burgeon). Mahagi, May 1925 (H. Schouteden). Medje (H. Lang and J. P. Chapin). Kongolo (Dr. Russo). Loja River, at Ingerosa (near Irumu), attacking elephant, May 24, 1927 (R. P. Strong).

If I have correctly recognized this species, it is closely allied to *H. pulchella* Edwards, *H. nefanda* Edwards and *H. obsoleta* Edwards, which all would run in my key to *H. inornata*. *H. pulchella* may be separated from the others by the presence along the hind margin of the wing of a large hyaline spot in the second and fifth posterior cells. *H. nefanda* has a wide, hyaline half-circle in the first submarginal cell (above the appendix), which in *H. inornata* and *H. obsoleta* is replaced by a hyaline cross-streak before and behind the appendix. *H. obsoleta* differs from *H. inornata* in the absence of the short hyaline cross-streak in the apex of the wing (across the upper branch of the third longitudinal vein).

Haematopota neavei Austen

Haematopota neavei Austen, 1912, Bull. Ent. Res., III, p. 336, Pl. X, fig. 9 (♀♂; Tero Forest, southeastern Buddu, Uganda, 3,800 ft.). Neave, 1912, *loc. cit.*, III, pp. 291 and 322 (♀♂).

Belgian Congo. — Rubengera (or Lubengera), Ruanda, alt. about 1,500 m., September 30, 1924 (René Van Saceghem).

This species is known only from Uganda and Ruanda. It is extremely close to *H. inornata* Austen, of which it is possibly the mountain forest representative.

Haematopota nigripennis Austen

Haematopota nigripennis Austen, 1914, Bull. Ent. Res., IV, 4, p. 297, fig. 5 (♀; Lake George, Uganda).

Belgian Congo. — Arebi (Upper Uele District), June 1925 (H. Schouteden).

This most remarkable species, which has been beautifully figured by Austen, is known only from Uganda and the northeastern Belgian Congo.

Haematopota decora Walker

Haematopota decora Walker, 1850, 'Insecta Saundersiana,' I, Dipt., p. 454 (♀; Port Natal). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 128, Pl. XII, fig. 89 (♀).

Haematopota dorsalis Loew, 1858, Öfvers. Svenska Vet. Ak. Förhandl., XIV, (1857), p. 342 (♀; Caffraria).

Belgian Congo. — Dungu, one female; Tini (Uele District), one female (J. Rodhain).

This species appears to be widely distributed over the Ethiopian Region, since it has been recorded from Gambia and the Anglo-Egyptian Sudan to Cape Colony. The above females from the Congo agree in every respect with three females from Nyasaland (determined by Major Austen) and with specimens from Lourenzo Marques at the U. S. National Museum.

Haematopota cruenta Austen

Haematopota cruenta Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 416 (♀; Ruwe, Belgian Congo).

This species is known only from the type locality in the Katanga District. I have not seen it, but it has been included in the key after Austen's description.

Haematopota schoutedeni (Surcouf)

Chrysozona schoutedeni Surcouf, 1911, Rev. Zool. Afric., I, p. 89 (♀; Kindu, Belgian Congo).

This species is known only from the type specimen, which I had before me in drawing up the key to the Congo species.

In a former paper (1913, Rev. Zool. Afric., II, 3, p. 466), I referred to *H. schoutedeni* a female from the Samba River (on the railroad, about midway between Kindu and Kongolo), Belgian Congo. Upon comparing it with the type, however, I find several important differences, notably in the shape of the antennae, the first segment of which is much shorter; also the basal segment of the middle and hind tarsi has a conspicuous white ring (in *schoutedeni* they are barely paler at the extreme base) and the center of the (otherwise dark) discal cell is clear with a minute dark spot (in *schoutedeni* the discal cell has two remote clear cross-bands and a small, clear basal spot). This specimen appears to belong to a species closely allied to *H. cruenta* Austen, yet distinct.

Haematopota partifascia, new species

Female. — Length, 9.5 to 10 mm.; width of head, 3.25 mm.; width of frons at vertex, about 1 mm.; length of wing, 8.5 to 9 mm.

A brown species, with dark wings, with many of the pale spots quadrangular; hind tibiae with a single, basal, white band. Preapical pale marking of the wing not reaching the posterior margin.

Head: frons grayish brown pollinose; three velvet brown spots, a very small one at middle, midway between vertex and frontal callosity, and two larger ones, with vertical diameter greater than the transverse, just above the ends of the frontal callosity, not quite touching the eyes; frontal callosity shiny blackish brown, rather prominent, widened at middle both above and below, touching the eyes; face and cheeks gray pollinose, with a small, three-sided, brown spot in contact with each eye just below the level of the antennae; clypeal pits small, deep, brown in color; palpi gray, rather slender, clothed with short black hairs, distinctly shorter than the proboscis which is dark brown. Antenna dark, nearly black, rather slender; first segment, seen from above, uniformly thick and about three times as long as wide, in profile gradually wider toward the apex; third segment slender, the basal division moderately and fairly uniformly widened throughout, slightly longer than the first segment. Thorax brown dorsally, with pale short hairs on the disk; anteriorly with evidences of five gray lines, none of which reach the transverse suture in their full intensity, although all but the middle one may be followed that far; posterior to the transverse suture there are two small gray spots adjacent to the suture and on either side a faint gray stripe; these indicate four gray stripes, each pair of which is connected on each side in front of the scutellum by rather prominent, curved, gray markings. Scutellum widely margined with brown, leaving a transverse, three-sided, gray area basally; in some specimens the brown border is divided on the mid-dorsal line by a rather narrow backward extension of the gray basal area. Abdomen brown above, slightly paler toward base; each segment with a narrow, posterior, gray border; no lateral spots; venter much like the dorsum, except for the presence of a glaucous covering. Legs dark, nearly black, femora somewhat paler; fore and hind tibiae each with one wide, basal, white band; middle tibiae each with a wide, basal, white band and a narrower one of the same color near apical third; tarsi black, the basal segment of the middle and hind tarsi very narrowly whitish at base. Wing dark, nearly black, with small pale spots many of which are quadrangular in form; the pale markings consist of a rosette at the forking of the third vein, another at the apex of the discal cell, and a third in the region of the apex of the second basal cell, beside some scattered spots adjacent to these rosettes; the axillary cell has a nearly circular pale marking basally and an angulated marking crossing it near middle; the preapical pale marking is narrow and does not reach the posterior border of the wing. Halteres almost entirely pale yellow.

Belgian Congo. — Female holotype and nine female paratypes from Lubutu, January 29, 1915.

This new species is nearly related to *H. divisapex* Austen and *H. fasciatapex* Edwards, but differs from both in not having an entire preapical fascia in the wing, from the last-named species in having the basal band of the middle tibiae much wider than the other one, and from the former in not having the basal half of the axillary cell hyaline. In addition, *H. divisapex* has two pale rings on the hind tibiae.

Haematopota insatiabilis Austen

Haematopota insatiabilis Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 222 (♀; Zomba Plateau, Nyasaland).

Belgian Congo. — Sankisia, November 1911. Panda River, October 18, 1920 (Mich. Bequaert).

Northern Rhodesia. — Kafue River (Mich. Bequaert).

This species is known only from Nyasaland, the Katanga District of the Belgian Congo, and Northern Rhodesia.

Haematopota vittata Loew

Haematopota vittata Loew, 1858, Öfvers. Svenska Vet. Ak. Förhandl., XV, p. 336 (♀; Ngami, Bechuanaland); 1860, 'Dipteren-Fauna Südafrikas,' I, p. 50, Pl. I, figs. 28, 29, and 30 (♀).
Haematopota pulchrithorax Austen, 1906, 'Second Rept. Wellcome Res. Lab. Khartoum,' p. 54, fig. 20*A*, Pl. V (♀ ♂; Salisbury, Southern Rhodesia).

Belgian Congo. — Ruwe, Katanga District, March 1907 (S. Neave). Lubumbashi River (near Elisabethville), November and February (Mich. Bequaert).

H. vittata is widely distributed in the savannas of the Ethiopian Region, being known from Northern Nigeria, French Equatorial Africa, the Anglo-Egyptian Sudan, the Katanga District of the Belgian Congo, Uganda, Kenya Colony, Somaliland, Tanganyika Territory, Northern and Southern Rhodesia, Nyasaland, Portuguese East Africa, Transvaal, and Zululand. I have compared the specimens from Katanga with a female from Komati Poort, Transvaal, at the U. S. National Museum.

Of the specimens recorded by me as *H. vittata*, in 1913 (Rev. Zool. Afric., II, 3, p. 466), that from Kawawa is *H. mactans* Austen. My figure of the antenna (*loc. cit.*, fig. 13), however, agrees better with that of *H. vittata* and it is possible that the specimens from the Kundelungu (not now before me) were correctly identified.

Enderlein (1925, Mitt. Zool. Mus. Berlin, XI, 2, p. 402) places *H. vittata* in the "genus" *Parhaematopota*, but the structure of the first antennal segment is as in his "genus" *Tylopelma*.

Haematopota ochracea (Bezzi)

Chrysozona (*Haematopota*) *ochracea* Bezzi, 1908, Ann. Soc. Ent. Belgique, LII, p. 375 (♀; Vivi, Belgian Congo).

Tylopelma patellicorne Enderlein, 1922, Mitt. Zool. Mus. Berlin, X, 2, p. 350 (without specific description); 1925, *loc. cit.*, XI, 2, p. 399 (♀; to the west of Lake Albert, and Avakubi on the Aruwimi River, Belgian Congo. Both these localities are in the Ituri District of the Belgian Congo, not in "East Africa" as stated by Enderlein. The fauna of the Ituri District is distinctly West African).

Belgian Congo. — Malela, in the estuary of the Congo, several females and one male, June 1915, and September 10, 1913; Moho near Lesse (in the Semliki Forest), June 9, 1914; Tete (in the Ituri Forest, between Penge and Irumu), February 22, 1914. Arebi (J. Rodhain). Zambi, one female (H. Lang and J. P. Chapin). Congo da Lemba, December 27, 1911 (R. Mayné). Matadi, June 1926 (J. Ghesquière). Temvo, March 1922 (H. Schouteden). Moto (Madyu) (L. Burgeon).

From the very brief description *H. ochracea* could not possibly be recognized. Fortunately, through the kindness of Dr. H. Schouteden, I was able to study the type. It is a species closely allied to *H. vittata*, and, it seems, widely distributed in the Belgian Congo. It was recently redescribed by Enderlein from the Ituri Forest as *Tylopelma patellicorne*.

The following description may help to recognize *H. ochracea:*

Female. — Length, 10 to 11.5 mm.; width of head, 4 mm.; width of frons at vertex, just under 1 mm.; length of wing, 10 mm.

Head: frons gray pollinose, slightly mottled with brown, with three dark colored, velvety spots of which the median (upper) one is rounded and slightly smaller than the two lateral ones; these are somewhat three-sided with the angles rounded, narrowly separated from the frontal callosity and still more narrowly from the eyes. Frontal callosity rather light brown, narrow, transverse, reaching the eyes; but as the ends are oblique and not exactly parallel to the eye margins, a very narrow pollinose wedge is visible between the dorsal part of the frontal callosity and the eye on each side. Below the frontal callosity and above the antennae a very narrow gray pollinose streak reaches the eyes; this streak is widened at middle and extends downward between the antennae. Upper half of face brown across down to near the lower extremity of the eyes, with a yellowish gray spot; lower half gray pollinose, excepting the minute clypeal pits which are brown; the two areas sharply contrasting. Palpi pale brown, with black hair, shorter than the proboscis which is of the same color. Antenna yellowish brown; first segment about three times as long as wide, distinctly swollen and with a deep transverse notch before the apex on the upper side; second segment short, most prominent dorsally; third segment in profile at widest point scarcely wider than the first segment, its basal division nearly evenly curved ventrally, rapidly widened dorsally to middle of its length and then as rapidly narrowed; three terminal divisions slender, short, much shorter than the basal division. Thorax brown dorsally; in well-preserved specimens with the median portion mostly gray; five narrow, gray stripes before the transverse suture, the mid-dorsal one narrow and visible for some distance beyond the suture where it connects with a much wider gray marking which reaches the scutellum; stripes on either side of the mid-dorsal stripe and nearest to it also continued beyond the transverse suture, curved toward each other and continuous with the wide middle stripe back to the scutellum; this wide middle stripe is furcate posteriorly and sends a curved branch in each direction along the suture before the scutellum and each finally joins a lateral thoracic stripe which is shown quite faintly above the base of the wing. Sides and venter of thorax pale brown in ground color, but thinly and uniformly gray pollinose. Scutellum with a brown spot on either side of the middle, otherwise reddish yellow and gray pollinose. Abdomen dorsally brown, with narrow posterior margins of the segments, a poorly defined mid-dorsal stripe, and a small spot on either side of segments three to seven, gray. In some specimens the last three or four segments, sometimes other segments, are slightly fuscous brown at the sides. Venter of abdomen brown, fuscous brown apically, and thinly gray pollinose. Wing pale grayish brown, with numerous nearly white markings; stigma dark brown; apical fascia, starting just beyond the tip of the second vein, widest along the costa, in general narrow, curved slightly forward at first, then backward and finally nearly straight, reaching to near the middle of the first submarginal cell; pale markings toward apex and across the posterior cells narrow, many of them constricted in such a way as to form more or less hourglass-shaped spots in many of the cells; axillary cell and all the posterior cells with the posterior angles narrowly whitish hyaline. Legs in general pale, all the femora pale yellowish brown with some black hair; fore tibiae whitish basally, apical two-thirds or more pale brown; middle and hind tibiae each with two nearly white rings, one near base and the other on apical third; each tarsus, from the apex of the first segment on, dark fuscous brown, the middle and hind basitarsi mostly whitish.

Male (undescribed). — Length, 12 mm.; width of head, 4.5 mm.; length of wing, 10 mm.

Head more hairy than in the female; palpi shorter and more conical, directed forward; third segment of the antenna of the same general form as in the female, but much shorter, plainly shorter than the first segment which is as in the female. Eyes widely in contact at the middle, mostly composed of large facets, although there is a distinct area of small facets below, which curves upward behind and gradually narrows until it disappears some distance before the vertex is reached. Brown of upper part of the face less evident than in the female; in fact it is not sharply defined below, but gradually fades into the gray above the palpi. Body, wings and legs colored very near as in the female.

One male from Malela.

H. ochracea, which is at present known only from the Belgian Congo, is extremely close to *H. vittata* Loew, of which it is perhaps the rain forest representative. The only differences which I have been able to discover are those mentioned in the key. I believe, however, that they are of specific value, since they hold good for all the specimens I have seen (seven of *vittata* and eleven of *ochracea*). Bezzi's statement that *H. ochracea* is related to *H. fulva* Austen is misleading, since the two have absolutely nothing in common.

Haematopota mactans Austen

Haematopota mactans Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 106 (♀; Wadelai, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 129, Pl. XII, fig. 90 (♀).

Belgian Congo. — Kapema to Kipaila, on the Luapula River (S. Neave). Kawawa River (near Sankisia), June 1911 (J. Rodhain).

This species is widely distributed, being known from Somaliland, Abyssinia, Uganda, Kenya Colony, Tanganyika Territory, Northern and Southern Rhodesia, the Katanga District of the Belgian Congo, Nyasaland, and Portuguese East Africa. It is probably restricted to savanna country.

Haematopota hirta Ricardo

Haematopota hirta Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 100 and 101, Pl. III, fig. 1 (♀; Uganda).

Haematopota nigrescens Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 100 and 103, Pl. III, fig. 3 (♀; Altri-iga, Mawe, Kenya Colony).

Belgian Congo. — Kabango, northeast of Ruchuru (near the border of Uganda), at 1,800 m., November 4, 1914; Rueru, on the southwestern slope of Mt. Mikeno, at 9,500 ft. and also at 7,250 ft., March 1927. Lubengo, northwest of Lake Edward, April 28, 1927.

Uganda. — Kisolo, April 3, 1927.

Most of the specimens taken were attempting to bite man.

H. hirta is known from Uganda, the neighboring part of the eastern Belgian Congo, Kenya Colony, and the lower slopes of Mt. Kilimanjaro. It evidently prefers the mountain forest.

Haematopota tabanula, new species

Female. — Length, 11 mm.; width of head, 3.5 mm.; width of frons, 0.6 mm.; length of wing, 7 mm.

Appearing much like a small species of *Tabanus*, but slender and with the wings ornamented. Abdomen brown with white markings. White markings of each segment consist of a mid-dorsal streak, lateral spots, side margins, and narrow posterior margins. Wing rather pale. Legs largely yellowish; tibiae with alternate light and darker bands.

Head: frons yellowish gray pollinose; central frontal spot very small, nearly round; lateral frontal spots rounded, well above the frontal callosity and not reaching the eyes; frontal callosity transverse, about the same width throughout, very nearly reaching the eyes; face and cheeks gray pollinose and white pilose, without spots, only slightly brownish near the antennae, especially laterally. Antennae rather pale yellow; first segment shorter than usual, about half as long as the entire length of the third segment; third segment wide at base, dorsal basal angle not prominent, gradually narrowed to annulate portion which is small and not over one-third as long as the basal division. Palpi gray, slender, with white hairs basally and sparse black hairs otherwise; beard white. Thorax dorsally brownish, with faint gray stripes, clothed mostly with short pale hairs; sides and venter white and white hairy. Scutellum with sides and disk gray; sides quite plainly brown. Abdomen: above brown; first segment with lateral and posterior margins and spot on either side of the scutellum gray; second segment with a transverse patch on anterior margin connected with a lateral spot on either side, a narrow mid-dorsal streak, and narrow lateral and posterior margins, gray; third segment similar to second; fourth and fifth segments similar to second and third, except that the transverse spot on anterior margin is not visible; sixth and seventh segments each with a single gray marking, emarginate posteriorly, and the margin gray. Venter of abdomen nearly uniformly brownish gray; end segment black hairy. Wing with brown stigma, the anterior part of which is pale; whole wing quite pale; light and dark markings not strongly contrasted, but much broken up; second basal cell with a pale cross-band near basal third and a lunulate spot in apical third; discal cell with a pale, oblique cross-band near basal third and a nearly divided patch at apical third; axillary cell with a rounded, pale, basal marking and a median, light, angular streak; costal cells yellowish hyaline; veins pale. Halteres pale yellowish. Legs: femora all nearly uniformly pale yellowish; fore ones partially dark hairy above, otherwise pale hairy; other femora entirely pale hairy; fore tibiae pale on basal two-fifths, remainder dark; middle and hind tibiae much alike, each banded with two light and two dark bands as follows: light basally, dark at middle followed by light, and dark apically; all the tarsi in large part infuscated, although the middle and hind metatarsi are yellowish basally.

BELGIAN CONGO. — Lubutu, one female holotype and one female paratype, January and February 1915.

This species superficially resembles *H. crudelis* Austen and *H. cruentata* Austen, although not closely allied to either. The relatively narrow frons readily separates *H. tabanula* from the other species with somewhat similar abdominal markings or antennae.

Haematopota hirsutitarsus Austen

Haematopota hirsutitarsus Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 286 (♀; Bailundo, Benguela, Portuguese West Africa).

BELGIAN CONGO. — Kasununu River (near Shinsenda), one female, May 5, 1912. This locality is on the Congo-Zambesi watershed, close to the border of Rhodesia.

This species is known from Benguela, Northern Rhodesia, and the Katanga District of the Belgian Congo.

Haematopota angustifrons Carter

Haematopota angustifrons Carter, 1915, Ann. Trop. Med. Paras., IX, p. 185, fig. 6; Pl. XIII, fig. 2 (♀; Belgian Congo).

Belgian Congo. — Lubutu, three females, January 29, 1915. Uele District, six females (one labelled Bwasabi, December 21, 1913) (J. Rodhain).

The unusually narrow frons, with the prominent basal callosity, readily separates this species from most others with similar antennae or coloration. *H. pallidicornis* Edwards (1916, Bull. Ent. Res., VIII, p. 149, fig. 3, Pl. II, fig. 10; ♀), from Southern Nigeria, is extremely close to *H. angustifrons*.

Haematopota divisapex Austen

Haematopota divisapex Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 98 (♀; Ruwe, Belgian Congo).

Belgian Congo. — Valley of the Lubumbashi River (G. Buttgenbach).

This species is known only from the Katanga District of the Belgian Congo.

Haematopota torquens Austen

Haematopota torquens Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 409 (♀; Insu, Ashanti, Gold Coast); 1909, 'Illustr. African Blood-Suck. Flies,' p. 131, Pl. XIII, fig. 92 (♀).
Chrysozona torquens Surcouf, 1911, Rev. Zool. Afric., I, p. 89.

This species has been recorded by Surcouf (1911) from Lukungu in the Lower Belgian Congo. Otherwise it is known only from the Gold Coast. I have not seen it.

H. torquens, which is extremely close to *H. guineensis* Bigot, belongs in the group of species with two distinct pale rings to the hind tibiae, a slender, scarcely incrassate first antennal segment, and the basal division of the third segment elongate. In my key it appears to run to *H. divisapex* Austen and I am unable to discover from the description how it may be separated from that species.

Haematopota guineensis Bigot

Haematopota guineensis Bigot, 1891, Bull. Soc. Zool. France, XVI, p. 76 (♀; Assinie, Ivory Coast). Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 99, 100 and 110, Pl. IV, fig. 10 (♀).
Haematopota cordigera Bigot, 1891, Ann. Soc. Ent. France, LX, p. 369 (♀). Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 411, footnote. Not *H. cordigera* Bigot, 1891, Bull. Soc. Zool. France, XVI, p. 76.

Liberia. — Mt. Coffee, one female, March 1897 (R. P. Currie. — U. S. Nat. Mus.).

This West African species is known from Sierra Leone, Liberia, the Ivory Coast, Gold Coast, Northern and Southern Nigeria, Cameroon, and Portuguese West Africa.

I cannot agree with Austen (1908) that the name *cordigera* should be used for this West African species. In his paper in the Bull. Soc. Zool. France (which appeared several months before that in the Ann. Soc. Ent. France), Bigot not only indicated the characters by means of which, in his opinion, *H. guineensis* might be recognized, but he also proposed the name *H. cordigera* for the Indian species, which then dates from 1891, and not from 1892, as Austen seems to infer.

Haematopota stimulans Austen

Haematopota stimulans Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 108 (♀; Nyasaland).
Chrysozona stimulans J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 466, fig. 12 (♀).

I have recorded this species, of Nyasaland and Northern Rhodesia, from several localities in the Katanga District of the Belgian Congo. Two specimens are before me from Mufungwa (Sampwe); they do not seem to differ from a female of Mpika, Northeastern Rhodesia, named by Austen.

Haematopota harpax Austen

Haematopota harpax Austen, 1914, Bull. Ent. Res., IV, p. 289 (♀; Coquilhatville, Belgian Congo).

Belgian Congo. — Bumba (H. Lang and J. P. Chapin). Nouvelle-Anvers, December 22, 1926; near Lulonga, December 21, 1926; Irebu, December 17, 1926; Lisala, October 24, 1913. Yangambi, 1925 (J. Ghesquière).

Through the kindness of Dr. H. Schouteden, I have been able to compare my specimens with two paratypes from Bolombo and Lisala.

This interesting species is common on the middle, or equatorial, course of the Congo River, between the mouth of the Ubangi and that of the Itimbiri. It comes on board ship and bites man. The specimen caught near Lulonga was attracted by light in the evening.

Haematopota rufula (Surcouf)

Chrysozona rufula Surcouf, 1909, Bull. Mus. Hist. Nat. Paris, XV, p. 537 (♀; Upper Sangha, French Congo).

I have seen one specimen of this species labelled "Congo belge" at the Congo Museum. It appears to be one of Surcouf's paratypes, since it bears a label in the author's handwriting "*Chrysozona rufula*, Congo." I believe it was obtained in the French Congo. I have included the species in my key in order to point out its relationship to *H. brunnescens* Ricardo.

Haematopota brunnescens Ricardo

Haematopota brunnescens Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 100 and 107, Pl. IV, fig. 7 (♀; Buruli on the Lukogo, between Junda and Kiseliza, Uganda). H. H. King, 1911, 'Fourth Rept. Wellcome Res. Lab. Khartoum,' vol. B, p. 126, Pl. I, fig. 3 (♀).
Chrysozona (*Parhaematopota*) *brunnescens* J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 465, fig. 11 (♀). Surcouf, 1914, *loc. cit.*, III, p. 474.

Belgian Congo. — Kundelungu Plateau (S. Neave). Kasepa River (near Elisabethville), one female, September 1923 (Mich. Bequaert).

I have also seen several females, from the Maniema and the Lower Katanga

(Kasongo; Kongolo; Lukuga River; and Niemba), which are very similar to *H. brunnescens*, but differ in the smaller size (8 mm.), the more blackish coloration, and the narrower and more regularly elliptical basal division of the third antennal segment. I am inclined to regard them as specifically distinct. They appear to be closely allied to *H. ingluviosa* Austen.

H. brunnescens has been recorded from the Anglo-Egyptian Sudan, Uganda, Kenya Colony, and the Katanga District of the Belgian Congo.

Haematopota sanguinaria Austen

Haematopota sanguinaria Austen, 1908, Ann. Mag. Nat. Hist., (8) I, p. 417 (♀; Lunga River, Kasempa District, Northwest Rhodesia).
Chrysozona sanguinaria J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 466, fig. 14 (♀).

Belgian Congo. — Upper Lualaba Valley, 4,000 ft. (S. A. Neave). Panda River, October 1920 (Mich. Bequaert). Lufuduzi (Katanga District), September 1924; Kasese (Katanga), July 1924; Elisabethville, September 1923 (C. Seydel).

This species is rather common in Northern Rhodesia. I have also found it in the Katanga District (Sankisia) of the Belgian Congo.

Haematopota tumidicornis Austen

Haematopota tumidicornis Austen, 1912, Ann. Mag. Nat. Hist., (8) IX, p. 366 (♀; Athi Plains Game Reserve, 5,000 ft., Kenya Colony).

Belgian Congo. — Kundelungu Plateau, at about 1,600 m., one female, December 19, 1912.

This species is known only from Kenya Colony and the Katanga District of the Belgian Congo.

H. tumidicornis forms the transition between *Haematopota*, proper, and *Parhaematopota*. The basal division of the third antennal segment, although still fully twice as long as wide, is more expanded than in most species of *Haematopota*.

Haematopota furva Austen

Haematopota furva Austen, 1912, Bull. Ent. Res., III, p. 334, Pl. XI, fig. 7 (♀ ♂; Daro or Durro Forest, Uganda); 1926, Ark. f. Zool., XVIII B, No. 6, p. 2 (♀).

Belgian Congo. — Butagu Valley, Mt. Ruwenzori, at 1,900 m.; Lamia Valley, Mt. Ruwenzori, at 1,000 to 2000 m.; Masisi, at 1,800 m.; Boswenda (south of Ruchuru), at 1,900 m. Arebi; Gombari (J. Rodhain).

This species is peculiar to the forests of the northeastern Belgian Congo, Uganda, and the western part of Kenya Colony. It was by no means uncommon in the mountain forest of the western slopes of Ruwenzori during April and June 1914. One of the specimens from the Butagu Valley was sent to Major E. E. Austen, who kindly compared it with the type at the British Museum.

H. furva is not known from East Africa proper. Austen's record of 1926 refers to the Ituri District of the Belgian Congo, not to Tanganyika Territory.

Haematopota ugandae Ricardo

Haematopota ugandae Ricardo, 1906, Ann. Mag. Nat. Hist., (7) XVIII, pp. 100 and 105, Pl. III, fig. 5 (♀; Uganda). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 132, Pl. XII, fig. 93 (♀).

Uganda. — Behungi, on the Escarpment, at 8,300 ft., one female biting man, April 4, 1927. Between Chakansengula and Kasengui, March 1912 (L. Bayer).

This species is known with certainty only from Uganda and the western part of Kenya Colony. Bezzi (1914, Ann. Mus. Zool. Univ. Napoli, N. S., IV, No. 14, p. 2) has recorded it from Northern Rhodesia (between Broken Hill and Bwana Mkubwa), but I doubt the correctness of this identification.

Hippocentrum Austen

Hippocentrum Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 352. Type by original designation: *Hippocentrum versicolor* Austen, 1908.

This genus is very closely allied to *Haematopota*, the only distinguishing characters being those given in the key to the genera. It also holds the wings in roof-like fashion when at rest. It is exclusively Ethiopian and restricted to the moist and warm rain forests of the West African Subregion. Four distinct species have been described. Two of them are found in the Belgian Congo and may be separated as indicated below. Both are shiny black, with the two basal segments of the antennae partly, the tibiae mostly, and the tarsi partly, dirty yellowish to white. *H. murphyi* Austen, of Sierra Leone, differs from either in the much larger size (11.5 to 12 mm.), in the tibiae being black over more than their apical half, as well as in the almost uniformly infuscate wings. The fourth species, *H. concisum* Speiser, of Cameroon, is conspicuously distinct by the yellowish-brown abdomen.

1. Wing fairly uniformly infuscated, slightly paler in the basal half, darkest about the black stigma, with three short hyaline streaks: one below the base of the stigma covering the base of the first submarginal and first posterior cells, one before the fork of the third longitudinal vein extending from the costa to the third longitudinal vein, and one in the apex of the wing from the tip of the second longitudinal vein to the hind margin. Length, 8.5 to 9 mm. .... *H. strigipenne.*

   Basal anterior half of the wing (as far as the stigma, the base of first submarginal, first posterior and discal cells, and the fifth longitudinal vein) nearly hyaline; the extreme base, the costal cell, and the stigma, yellowish; the remainder of the wing uniformly infuscated, with a broad hyaline streak running before the fork of the third longitudinal vein from the costa to the lower angle of the discal cell. Length, 9 mm. .... *H. versicolor.*

Hippocentrum strigipenne (Karsch)

Haematopota strigipennis Karsch, 1889, Entom. Nachrichten, XV, p. 240 (♀; Sibange Farm, Gaboon River, French Congo).

Hippocentrum strigipenne Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 353.

Haematopota trimaculata Newstead, 1907, Ann. Trop. Med. Paras., I, p. 42, Pl. IV, fig. 2 (♀; Yakusu, Belgian Congo).

Hippocentrum trimaculatum Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 353.

Chrysozona (Hippocentrum) trimaculata J. Bequaert, 1913, Rev. Zool. Afric., II, 3, p. 465, fig. 10 (♀).

Belgian Congo. — Between Stanleyville and Ponthierville, common in the railroad carriages, January 15, 1927; Eala, September 8, 1926; Na'Ndefu (between Penge and Irumu), February 27, 1914; Lubutu, January 29, 1915. Nala (J. Rodhain). Coquilhatville (J. De Riemaecker). Kongolo, December 1923 (Mich. Bequaert). Stanleyville, eleven females and two males, as prey of *Bembix bequaerti* Arnold var. *dira* Arnold (H. Lang and J. P. Chapin). Loja River at Ingerosa (near Irumu), attacking elephant, May 24, 1927 (R. P. Strong). In the Congo Museum, Tervueren, there are also specimens from Kindu (Averza); Api (Laplume); Ponthierville (Prince Albert of Belgium); between Kwesi and Kilo (L. Bayer); Bambili (Rodhain); Mobwasa (de Giorgi).

This species is a very vicious biter. It was extremely common in the forest of the mid-Semliki Valley, between Lesse and old Beni, in July 1914, its abundance and tenacity rendering it very troublesome to white men and native carriers alike.

H. strigipenne is readily recognizable by the color of the wings which are uniformly infuscated, though darker in the distal half especially toward the anterior margin; there is a more or less hyaline transverse mark just before the stigma, usually filling the extreme base of the first submarginal and first posterior cells; a narrow transverse hyaline streak just before the tip of the wing; and, between these two, a somewhat wide, more or less distinct hyaline mark, descending from the costa to the fork of the third longitudinal vein, often interrupted or bifurcate below. In addition, the body is black and shiny; the palpi much swollen; the tibiae and basal half of middle and hind tarsi white, the apical third of the fore tibiae brownish black. The presence of the preapical hyaline streak in the wing distinguishes it from both *H. versicolor* Austen and *H. murphyi* Austen.

The *male*, which appears to be as yet undescribed, is extremely similar to the female in coloration of body, palpi, antennae, and legs, and also in the markings of the wing. Head distinctly larger than in the female; eyes contiguous for some distance; small facets confined to a rather small area on the outer inferior part of each eye; area of enlarged facets extensive, occupying practically three-fourths of each eye; palpi shorter, somewhat more enlarged basally than in the female and directed forward as usual in the males of Tabanidae.

Two males from Stanleyville.

This insect has generally been called *H. trimaculatum* in the Congo. But Karsch's description is sufficiently clear to make it certain that *Haematopota trimaculata* Newstead and *H. strigipennis* Karsch have been based upon the same insect.

The area occupied by *H. strigipenne* in West Africa is extensive, since the species has been recorded from the Ivory Coast, Dahomey, Sierra Leone, Southern Nigeria, and the French and Belgian Congo (as far east as the Semliki Forest and as far south as Kongolo).

Hippocentrum versicolor Austen

Hippocentrum versicolor Austen, 1908, Ann. Mag. Nat. Hist., (8) II, p. 354 (♀; Lagos, on the railway, 57½ miles from the coast, Southern Nigeria); 1909, 'Illustr. African Blood-Suck. Flies,' p. 134, Pl. XII, fig. 95 (♀).

Belgian Congo. — Bambili, one female (J. Rodhain). This interesting insect was sent to me by Dr. H. Schouteden, Director of the Congo Museum.

H. versicolor also is widely distributed, having been recorded from the Gold Coast, Southern Nigeria, Northern Nigeria, Cameroon, Uganda, the Lado Enclave of the Anglo-Egyptian Sudan, and the northeastern Belgian Congo.

CALLIPHORIDAE

Auchmeromyia luteola (Fabricius)

Musca luteola Fabricius, 1805, 'Syst. Antliat.', p. 286 (no sex given; Guinea).
Auchmeromyia luteola Brauer and v. Bergenstamm, 1891, Denkschr. Ak. Wiss. Wien, LVIII, pp. 391 and 420 (♀ ♂). Dutton, Todd and Christy, 1904, Memoir XIII, Liverpool School Tropical Med., pp. 49–54, Pl. III. Bezzi, 1908, Bull. Soc. Ent. Italiana, XXXIX, p. 75. J. Bequaert, 1913, Rev. Zool. Afric., II, 2, p. 145 (oviposition); 1915, Bull. Soc. Path. Exot., Paris, VIII, p. 459. Graham-Smith, 1913, 'Flies in relation to Disease, Non-Blood-Suck. Flies,' p. 212, Pl. XXI, figs. 1–2 (♀; larva). Roubaud, 1914, 'Et. Faune Parasitaire Afr. Occ. Franç.', I, p. 44, Pl. I, figs. 2–4 (♀ ♂ and larva).
Cosmina latecincta Bigot, 1874, Ann. Soc. Ent. France, (5) IV, p. 240 (no sex given; Natal).
Ochromyia senegalensis Macquart, 1851, 'Dipt. Exot.', Suppl. IV, p. 244 (♂; Senegal).
Auchmeromyia tilhoi Surcouf and Guyon, 1912, Bull. Mus. Hist. Nat. Paris, p. 423 (♀; Bôl, French Sudan).
Somomyia (Ochromyia) subtranslucida Bertoloni, 1861, Mem. Ac. Sci. Ist. Bologna, XII, p. 45, Pl. I, fig. 2 (♀; Inhambane, Portuguese East Africa).

LIBERIA. — Kolobanu, several adult flies, October 19, 1926. Reppo's Town, one female and several larvae in the native huts, August 31, 1926. Gbanga, several male and female flies and numerous larvae in native huts, September 1926. The native name of the maggot among the Kpwesi is "mboro."

BELGIAN CONGO. — Nya Ngezi, adult flies, February 3, 1927. Luvungi, adult flies, January 30, 1927. Lulenga, 1,800 m., one adult fly in a house, March 6, 1927.

The larva of *A. luteola* is the celebrated blood-sucking "Congo floor maggot," which lives in the huts of the African natives. During the daytime it hides in the dust of the adobe floor and walls. At night it comes out in search of sleeping human beings. The bite is apparently painless, and, to judge from the many engorged specimens found in the huts, the parasite has no trouble in completing its meal. So far as known, this insect transmits no disease. Its distribution covers practically the entire Ethiopian Region from Senegal, the Anglo-Egyptian Sudan and Eritrea to Natal and Southwest Africa. In the mountains of tropical Africa, it reaches an altitude of 2,300 m.

A. luteola is a specific parasite of man, which has not yet been found in nature associated with any other host, although Roubaud has raised it on other mammals, notably on the domestic pig. Moreover, there are in Africa several other closely allied species of muscoid flies, whose maggots suck the blood of wild animals: *Choeromyia boueti* Roubaud, *C. choerophaga* Roubaud, *C. bequaerti* Roubaud and *Pachychoeromyia praegrandis* (Austen).[1] The larvae of these species hide in the dirt at the bottom of the burrows of aardvark (*Orycteropus senegalensis* Lesson and *O. afer* Pallas) and warthog (*Phacochoerus africanus* Gmelin).

Cordylobia anthropophaga (Em. Blanchard)

Ochromyia anthropophaga Em. Blanchard, 1872, C. R. Ac. Sci. Paris, LXXV, p. 1134 (without description; name based upon an adult fly obtained from a larva attacking either man or dog in Senegal, and bred by Bérenger-Féraud).[1] Railliet, 1884, Bull. Soc. Centr. Méd. Vétér., XXXVIII, p. 77 (brief description of adult fly).

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[1] *Choeromyia* Roubaud (1911, C. R. Ac. Sci. Paris, CLIII, p. 553) and *Pachychoeromyia* Villeneuve (1920, Bull. Soc. Ent. France, p. 225) are hardly more than subgenera of *Auchmeromyia* Brauer and v. Bergenstamm (1891).

"Larvae from South Africa" R. Blanchard, 1893, Ann. Soc. Ent. France, LXII, C. R. Séances, p. cxx, figs. 1–2, and p. cxxix, fig. 3 (larvae and brief description of an adult).

Cordylobia anthropophaga Grünberg, 1903, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 412, Pl. I, figs. 1–6, and Pl. II, figs. 8–10 (larvae from man, dog, a small antelope, leopard, and monkey, in Cameroon, Tanganyika Territory, Southwest Africa, and Kenya Colony; adults, ♀ and ♂, bred from larvae in a dog at Bagamoyo, Tanganyika Territory, and in a monkey near Lake Nyasa). Roubaud, 1914, 'Etudes Faune Paras. Afr. Occ. Franç.,' I, p. 118, Pl. III, figs. 1–7 (♀ ♂, egg, larvae at three stages, and puparium).

Cordylobia gruenbergi Dönitz, 1905, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 252 (based upon larvae from Tanganyika Territory referred by Grünberg, 1903, to *Ochromyia anthropophaga* Em. Blanchard). Fülleborn, 1908, Beih. Arch. Schiffs- u. Trophenhyg., Beih. 6, p. 10, figs. 1–6 (♀, larva).

Cordylobia murium Dönitz, 1905, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 246, Pl., figs. 1–5 (♀ ♂, and larva from rats, Rubeho Mountains, south of Mpapua, Tanganyika Territory).

BELGIAN CONGO. — Kamaniola, six nearly adult larvae in the scrotum and one larva in the tail of a rat, *Mastomys coucha ugandae* (De Winton), January 31, 1927; this rat was in a dying condition and the sores also showed a secondary infection with sarcophagine maggots. Luebo, two larvae in the third stage from the skin at the ventral side of a wild rat (H. Schouteden. — Congo Museum, Tervueren).

UGANDA. — Northern Districts, two larvae in the third stage (J. Watt. — London School Trop. Med.).

NORTHERN NIGERIA. — Three almost full-grown larvae, probably from the region of Zungeru (W. B. Johnson. — London School Trop. Med.).

This well-known agent of cutaneous myiasis in man and animals is distributed throughout tropical Africa in the more open bush and savanna country, from Senegal to Natal. It is, however, not found in the humid rain forest belt, where it is often replaced by a near relative, *Stasisia rodhaini* (Gedoelst), discussed in the sequel. There is no record of *C. anthropophaga* from the Cape Province of South Africa, south of the Orange River.

The most complete account of the early stages, habits, and distribution of *C. anthropophaga* has been published by E. Roubaud in 1914. Notwithstanding the specific name "*anthropophaga*," this insect is only an accidental, though rather frequent, parasite of man. Cases where maggots from the human skin reach the adult stage and produce flies must be exceedingly rare, as the parasite is readily removed; so that the species would soon become extinct if man were its specific or chief host. The regular or normal hosts of this fly are very numerous in Africa, but certain wild rodents are probably its chief victims.

During the several years of his medical practice at Monrovia, Dr. Bouet has never observed *C. anthropophaga*. The Harvard Expedition also has failed to obtain any evidence of its occurrence in Liberia. In view of the abundance of this parasite in Sierra Leone, its absence in Liberia is noteworthy. In my opinion it is entirely due to the high humidity which prevails practically throughout the year.

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[1] Bérenger-Féraud, L. J. B. 1872. 'Etude sur les larves de mouches qui se développent dans la peau de l'homme au Sénégal.' C. R. Ac. Sci. Paris, LXXV, pp. 1133–1134 (with a note by Em. Blanchard, p. 1134).

The earliest account of these parasites appears to be that of C. Coquerel and Mondière, 1862, Ann. Soc. Ent. France, (4) II, pp. 95–103; and 1862, Gazette Hebdom. Méd. Chir., IX, pp. 100–101. They studied larvae from Senegal, but did not know the adult fly.

In several medical textbooks the common African cutaneous myiasis has been wrongly credited to the larva of *Bengalia depressa* (Walker). Although Austen and others have corrected this error, even recent books are repeating it.[1] It is perhaps too much to hope that it will ever disappear from the textbooks; yet it must be emphasized again that all known South African cases of cutaneous myiasis in man, due to calliphorine larvae, are caused by *Cordylobia anthropophaga*. The larva and life-history of *Bengalia depressa* are as yet totally unknown, but there is not a particle of evidence to show that this insect ever acts as a subcutaneous parasite of mammals.

Stasisia rodhaini (Gedoelst)

Cordylobia rodhaini Gedoelst, 1910, Arch. de Parasitologie, XIII, p. 538, figs. 1–4 (♀ and larva; Leopoldville, Belgian Congo). Gamble, 1914, Jl. Trop. Med. Hyg., XVII, p. 149. Loveridge, 1923, Proc. Zool. Soc. London, p. 703.

Stasisia rodhaini Surcouf, 1914, Rev. Zool. Afric., III, 3, p. 476 (♂ ♀). Rodhain and Bequaert, 1916, Bull. Scientif. France et Belgique, XLIX, 3, p. 265, figs. 7–13, Pl. XIX, fig. 1 (♀ ♂, larva).

"Larve de Lund" Gedoelst, 1905, Arch. de Parasitologie, IX, p. 575, figs. 1–3 (Belgian Congo).

French Congo. — Oguma, Gaboon, two larvae from the skin near the ear of a squirrel, *Heliosciurus punctatus* Temminck (C. R. Aschemeyer). Brazzaville (Capt. Modest. — Paris Museum).

Belgian Congo. — Bolobo, one larva from the skin of a duiker antelope, *Cephalophus aequatorialis* Matschie (H. Schouteden). Barumbu, several larvae from the same species of duiker, *Cephalophus aequatorialis* Matschie (J. Ghesquière). Bikoro, four larvae from the skin of a monkey, *Lasiopyga* (*Cercopithecus*) *wolfi* (Meyer) (H. Schouteden. — Congo Museum).

Tanganyika Territory. — Bagilo, Uluguru Mountains, three larvae under the skin of a forest rat, *Lophuromys aquilus aquilus* True (Arthur Loveridge).

S. rodhaini is the usual agent of cutaneous myiasis in the humid rain forest of equatorial Africa, where it replaces *Cordylobia anthropophaga* Grünberg of the savanna regions. It is especially common in the forest of the French and Belgian Congo, where its normal hosts are the small duiker antelopes and certain rodents (*Cricetomys gambianus* Waterhouse); exceptionally it attacks man, but it is doubtful whether the larvae ever become full-grown in that host. Its occurrence in the rain forest of the Uluguru Mountains, in East Africa, is of unusual interest in view of the presence there of other types of West African animals, far beyond their normal range. *S. rodhaini* has also been reported from northern Angola (San Salvador).

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[1] The error is found, for instance, in G. S. Graham-Smith, 1913, 'Flies in relation to disease. Non-bloodsucking flies,' p. 223; Fantham, Stephens and Theobald, 1916, 'The animal parasites of man,' p. 591; and W. D. Pierce, 1921, 'Sanitary entomology,' p. 190 (in the chapter on myiasis, by F. C. Bishopp). The mistake seems to have originated with Péringuey (1893, Trans. South African Phil. Soc., VIII, 1, p. 23); and, although this entomologist corrected it later, it was repeated by C. Fuller (1902, Natal Agric. Jl., IV, pp. 656-658) and R. M. Townsend (1903, Proc. Rhodesia Scient. Assoc., IV, 1, pp. 7–8). An error of a different kind, but tending to perpetuate the same confusion, is made by C. Fox (1925, 'Insects and disease of man,' p. 106), who places the two species, *anthropophaga* and *rodhaini*, in the genus *Bengalia*, with which they have nothing much in common, beyond subfamily and tribal characters.

TACHINIDAE

Subfamily Oestrinae

Rhinoestrus hippopotami Grünberg

Rhinoestrus hippopotami Grünberg, 1904, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 37, Pl., figs. 1–2 (larva from *Hippopotamus amphibius;* Ngaundere, Cameroon). Surcouf and Gedoelst, 1909, Bull. Soc. Path. Exot., Paris, II, p. 615, Pl. VII, figs. 1–2 (♀ ♂, and larva). Rodhain and Bequaert, 1916, Bull. Scientif. France et Belgique, L, 1–2, p. 127, figs. 17–18 (♀ ♂, larva and pupa).

Belgian Congo. — Ruchuru River, larvae from the nasal cavities of *Hippopotamus amphibius* Linnaeus, March 16, 1927 (R. P. Strong). Nyangwe, numerous larvae from hippopotamus (J. Ghesquière. — Congo Museum).

This nasal bot is a specific parasite of hippopotamus and is probably found throughout tropical Africa. At present, however, it is known only from Cameroon, the Belgian Congo, and the Upper Nile.

MUSCIDAE

Subfamily Cobboldiinae

Cobboldia loxodontis Brauer

Cobboldia elephantis africani seu *loxodontis* Brauer, 1897, Denkschr. Ak. Wiss. Wien, Math.-Naturw. Cl., LXIV, p. 267 (larva from the stomach of African elephants of unknown locality).[1]

Cobboldia loxodontis Roubaud, 1914, 'Et. Faune Parasit. Afrique Occid. Franç.,' I, p. 206, figs. 60–61 (larva). Rodhain and Bequaert, 1915, Bull. Soc. Path. Exot., Paris, VIII, p. 769 (♀ ♂, larva); 1919, Bull. Biol. France et Belgique, LII, 4, p. 412, figs. 4–7 (♀ ♂, larva and puparium). Gedoelst, 1919, Bull. Ent. Res., IX, 4, p. 337 (larva). J. Bequaert, 1920, Bull. Soc. Ent. France, p. 68. Gedoelst, 1923, Ann. Paras. Hum. Comp., I, p. 354, figs. 1–3 (larvae in the three stages). Bedford, 1927, 11th and 12th Repts. Dir. Vet. Res. South Africa, I, p. 491.

Cobboldia parumspinosa Gedoelst, 1916, Rev. Zool. Afric., IV, 2, p. 158 (based upon two larvae obtained by J. Kirk from an elephant in the basin of the Zambesi River).

Liberia. — Paiata, one larva, October 10, 1926.

Northern Nigeria. — Larvae probably from the region of Zungeru (W. B. Johnson. — London Sch. Trop. Med.).

Belgian Congo. — Mongende, larvae, April 18, 1921 (H. Schouteden). Basongo, larvae (H. Schouteden). Mankakati near Bolobo, larvae (H. Schouteden. — Congo Mus.). Karabumba near Beni, larvae, May 5, 1927 (R. P. Strong). Semliki Valley near old Beni, larvae, May 18, 1927 (R. P. Strong). Ingerosa near Irumu, larvae, May 24, 1927 (R. P. Strong).

Tanganyika Territory. — There are, at the British Museum, a number of larvae obtained in that region.

Cape Province. — Addo Bush, two larvae sent to me some years ago by the late Dr. Péringuey. Kenkelbosch, larvae, August 9, 1919 (L. Hill.— Imp. Bur. Ent.).

All the foregoing larvae were obtained from the stomach of the African elephant, *Loxodonta africana* (Blumenbach), of which this bot is a specific parasite. Gedoelst (1923) mentions larvae supposedly from a rhinoceros, but I suspect that this record was based upon an error in labelling the specimens.

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[1] Since Brauer's larvae were collected by O. Neumann, they came most probably from Tanganyika Territory.

The earliest mention of these parasites is by Cobbold, 1866, 'Catalogue of the Specimens of Entozoa in the Museum of the Royal College of Surgeons,' p. 24, where we read: "Two bots removed, with several others, from the stomach of a female elephant in Africa. Presented by Dr. J. Kirk, F. L. S." No further information is given, but the very same specimens were described and figured by R. Blanchard (1893, Ann. Soc. Ent. France, LXII, Bull. Séances, pp. cxxx–cxxxii, fig. 4), who recognized that they belonged to the genus *Cobboldia* and that they were specifically distinct from those of the Indian species, *C. elephantis* (Steel). In 1916, Gedoelst proposed the name *C. parumspinosa* for these larvae obtained by Kirk, but in 1923 he recognized that they were identical with those of *C. loxodontis* (Brauer).

C. loxodontis appears to be generally distributed in tropical Africa, wherever elephants are still found in the wild state. It has been recorded from Liberia, the Ivory Coast, the Gold Coast, the region of Lake Chad, the Belgian Congo, Uganda, Abyssinia, Tanganyika Territory, the Zambesi Valley, and the Cape Province.

Rodhainomyia chrysidiformis (Rodhain and Bequaert)

Cobboldia chrysidiformis Rodhain and Bequaert, 1915, Bull. Soc. Path. Exot., Paris, VIII, p. 773 (♀ ♂ and larva; from stomach of *Loxodonta africana*, at Api, Belgian Congo); 1919, Bull. Biol. France et Belgique, LII, 4, p. 421, figs. 8–12, Pl. III, figs. 1*A* and 1*B* (♀ ♂, egg, larva, and puparium).

Rodhainomyia chrysidiformis J. Bequaert, 1920, Bull. Soc. Ent. France, p. 68.

Cobboldia roverei Gedoelst, 1916, Rev. Zool. Afric., IV, 2, p. 156 (larva from African elephant, Wombali and Boma, Belgian Congo).

BELGIAN CONGO. — Semliki Valley, one larva in the stomach of *Loxodonta africana* (Blumenbach), May 18, 1927 (R. P. Strong). Mongende (H. Schouteden). Basongo (H. Schouteden). Mankakati near Bolobo (H. Schouteden).

This bot also is a specific parasite of the stomach of the African elephant, but is much rarer than *C. loxodontis*. It has been found thus far only in the Belgian Congo. Some elephants harbor both species of bots, others only *C. loxodontis*.

SUBFAMILY RUTTENIINAE

Ruttenia loxodontis Rodhain

Ruttenia loxodontis Rodhain, 1924, Bull. Soc. Path. Exot., Paris, XVII, p. 92, fig. 1 (larva; from *Loxodonta africana*, at Api, Belgian Congo); 1927, Ann. Paras. Hum. Comp., V, 3, p. 198, figs. 3–5, Pl. I, figs. 3–4 (♀ ♂).

BELGIAN CONGO. — Ingerosa near Irumu, larvae from the skin of *Loxodonta africana* (Blumenbach), May 24, 1927 (R. P. Strong).

This remarkable bot is a specific cutaneous parasite of the African elephant and is known at present from the Belgian Congo only. Both the larva and the adult fly present so many aberrant features that their relationships to the other Muscoidea are extremely remote. It seems most adequate to make the genus

Ruttenia the type of a distinct subfamily, which for the time being may be placed in the Muscidae. Eventually it may be raised to family rank.

Ruttenia loxodontis is the latest and by far the most interesting discovery made by my indefatigable friend, Dr. J. Rodhain, who during the past twenty years has been instrumental in unravelling many of the mysteries of the African bot-fly fauna. Attention may be called here to the fact that the Indian elephant likewise harbors a cutaneous fly larva, the identity of which is at present unknown. G. H. Evans[1] writes in this connection (p. 214):

> "Warbles or swellings due to the invasion of the subcutaneous tissues by the larva of one or more of the family Oestridae (gad-flies) are very common in elephants in various parts of the province [Burma] from the Chindwin to Tenasserim. As a rule they are numerous, but in some cases in the Meza forests mentioned by Mr. Petley of Messrs. Steel Brothers, the infestation was remarkable. He describes it as follows:
>
> "The elephants from which these bots were taken literally swarm with swellings in all parts — head, ears and body. The scars of recent eruptions are in some parts of the body so closely pitted as to impart to the skin a honeycomb appearance, showing that thousands of the parasites have burrowed out during the last few months. Curiously enough, only the elephants brought from India last year are affected, and no doubt their general unhealthy appearance is due to the presence of myriads of bots beneath the skin. In the elephants from which the specimens were taken the numbers were almost incredible.'
>
> "How the larvae reach the subcutaneous tissues has not yet been rightly explained. Many theories have been advanced, but the more common one would seem to favour the idea that the egg is deposited directly on the skin and the larva in the initial stage of its development gains inlet either by the hair follicles or sebaceous glands to its resting place.
>
> "Symptoms. — Swellings, so-called boils or warbles, of varying size. When the larvae are well developed towards the end of April and May (most commonly here) they produce inflammation and suppuration about them producing the so-called warbles. When the larvae are ripe they quit their abodes, usually stern first, after widening the openings.
>
> "Treatment. — When the nature of the swellings is recognized a little pressure applied to them will materially assist in setting the larvae free. The abscesses should be treated in the ordinary manner. The larva of this fly is about one-quarter inch long and consists of some nine segments. The larvae should be destroyed."

It would be of considerable interest to investigate whether these Indian cutaneous parasites are related to *Ruttenia* of the African elephant.

Subfamily Muscinae

In addition to the genus *Musca*, which in Africa includes many species, probably all of medical or economic interest, the subfamily Muscinae contains a number of true blood-sucking forms. In some respects these are transitional between the ordinary house-fly and the blood-sucking Stomoxydinae.

These hematophagous Muscinae have been placed in four different genera, *viz.*, *Philaematomyia* Austen, *Pristirhynchomyia* Brunetti, *Ptilolepis* Bezzi, and *Awatia* Townsend. At present each of these genera, which are rather doubtfully distinct, contains only one species. In all of them, the proboscis is heavier and longer than in *Musca*, somewhat hardened and thickened basally; but it ends in fleshy labella armed at the tip with stout teeth. Although observation has shown that these flies "bite," there is no actual *piercing* organ, since the fleshy termination of the proboscis is obviously incapable of being thrust into the skin of a vertebrate. These insects feed by cutting through the epidermis of their victim by means of the powerful teeth at the end of the tubular extension of the proboscis, and then sucking up the blood in the ordinary way (Austen).

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[1] Evans, G. H. 1910. 'Elephants and their diseases.' (Rangoon).

Only one of the four genera is known from Africa.

Philaematomyia Austen

Philaematomyia Austen, 1909, Ann. Mag. Nat. Hist., (8), III, p. 295. Monotypic for *Philaematomyia insignis* Austen, 1909 = *Musca crassirostris* Stein, 1903.

Philaematomyia crassirostris (Stein)

Musca crassirostris Stein, 1903, Mitt. Zool. Mus. Berlin, II, Heft 3, p. 99 (♀ ♂; Luxor, Cairo and Assuan, Egypt); 1909, Tijdschr. v. Entom., LII, p. 211 (♀ ♂); 1918, Ann. Mus. Nat. Hungarici, XVI, pp. 148 and 166. Patton, 1925, Philippine Jl. Sci., XXVII, p. 199.

Philaematomyia crassirostris Austen, 1921, Bull. Ent. Res., XII, p. 120. Bezzi, 1921, Ann. Trop. Med. Paras., XIV, pp. 336 and 337.

Musca modesta de Meijere, 1904, Bijdragen tot de Dierkunde, XVIII, p. 106 (♀ ♂; Pasuruan, Java).

Philaematomyia insignis Austen, 1909, Ann. Mag. Nat. Hist., (8) III, p. 298, figs. I—III (♀ ♂; described from several localities in India, Ceylon, Sokotra, Cyprus, Senegal, and the Belgian Congo; the holotype and allotype from India).

This species has been taken at Zambi, Belgian Congo, by Dutton, Todd, and Christy (see Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 140). It appears to be very widely distributed in the tropical and subtropical parts of the Old World.

Subfamily Stomoxydinae

The Stomoxydinae contain most of the true blood-sucking muscid flies, with the exception of the tsetse-flies (*Glossina*). They are essentially a group of the Old World tropics,[1] where they are represented by several genera and many species. Two of its members, however, *Stomoxys calcitrans* (Linnaeus) and *Haematobia irritans* (Linnaeus), have been spread by man far beyond their original range and are tending to become cosmopolitan.

Excellent characterizations of the subfamily have been given by Bezzi (1911, Arch. de Parasitologie, XV, p. 120) and more recently by Malloch (1928, Ann. Mag. Nat. Hist., (10) II, p. 316). Malloch states that it is readily separable from the other subfamilies of Muscidae "by the structure of the proboscis, which is heavily chitinized and rigid, swollen at base, gradually tapered from basal swelling to apex, and without fleshy apical labella. The palpi may be much shorter than the proboscis or almost as long as it, and the arista may be furnished with long hairs only on the upper side, or have additional shorter hairs below. The fourth wing vein is always curved forward at apex, but never angularly bent, and the lower calypter is much larger than the upper, narrowly rounded at apex, and well separated from scutellum at base on inner side. All genera have the pteropleura and prosternum haired in part." It may be added that both sexes bite and have the same structure of the proboscis.

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[1] Malloch has recently described a *Bdellolarynx flavicornis* from Surinam. There is also a *Haematobia alcis* Snow supposedly peculiar to North America; but according to Aldrich (1930, Proc. Ent. Soc. Washington, XXXII, p. 28), this might be identical with *Bdellolarynx* (*Lyperosiops*) *stimulans* (Meigen), of Europe.

The subfamily Stomoxydinae comprises the following five genera: *Stomoxys* Geoffroy, *Haematobia* Lepeletier and Serville, *Bdellolarynx* Austen, *Stygeromyia* Austen, and *Haematobosca* Bezzi. Four of these are represented in Africa, where the subfamily probably contains more species than in any other part of the world.

Stomoxys Geoffroy

Stomoxys Geoffroy, 1764, 'Hist. Abrégée des Insectes,' II, p. 538. Monotypic for *Conops calcitrans* Linnaeus, 1758, which is cited in the synonymy, although not by name.

Various species of *Stomoxys* must be regarded as contributing factors in the spread of certain trypanosomiases of animals, although there is no proof as yet that they ever act as regular intermediate hosts to the trypanosomes.

In 1926 ('Medical Rept. Hamilton Rice 7th Exp. Amazon,' pp. 236–237), I have reviewed the evidence connecting *Stomoxys* with certain diseases, especially with the mechanical transmission of trypanosomiases in Africa, India, the Philippines, and South America. Most convincing seemed to be Mitzmain's experiments with *S. calcitrans* (Linnaeus) and *Trypanosoma evansi* Steel, the causative agent of "surra" in the Oriental Region. Some additional work on this subject may be briefly mentioned here.

In Mauritius, according to experiments carried out by Moutia,[1] *Stomoxys nigra* Macquart is able to transmit the parasite of surra (*T. evansi*) by interrupted feeding from guinea pig to guinea pig and to dog. No infection could be produced if thirty minutes or more elapsed between the feed on an infected and that on a healthy animal. In the Philippines, however, R. A. Kelser [2] was unsuccessful in his attempts to transmit surra from infected to healthy white rats by means of *Stomoxys calcitrans* (Linnaeus) and *Haematobia exigua* (de Meijere), while he succeeded in doing so with *Tabanus striatus* Fabricius. Similar unsuccessful attempts were made with the same species of blood-sucking Muscidae by O. Nieschulz in Java.[3]

Edm. Sergent and Donatien [4] have shown experimentally that *Stomoxys calcitrans* (Linnaeus) transmits trypanosomiasis of camels, caused by *Trypanosoma berberum* Edm. and Et. Sergent (= *T. soudanense* Laveran), in North Africa. The transmission is purely mechanical and occurs when a fly bites a healthy animal immediately after feeding on a diseased one. It will be recalled that this disease is also transmitted by tabanids. Sergent and Donatien are of the opinion that tabanids are the usual carriers in open country, while *Stomoxys* is important in more densely settled localities. Donatien and Lestoquard[1] also believe that the same *Trypanosoma berberum* is occasionally conveyed from camels to dogs by *Stomoxys*, but they have not shown this by experiments.[2]

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[1] Moutia, A. 1928. 'Surra in Mauritius and its principal vector, *Stomoxys nigra*.' Bull. Ent. Res., XIX, pp. 211–216.

[2] Kelser, R. A. 1927. 'Transmission of surra among animals of the equine species.' Philippine Jl. Sci., XXXIV, pp. 115–141, 2 pls.

[3] Nieschulz, O. 1927. 'Zoologische bijdragen tot het surraprobleem. XIX. Overbrengingsproeven met *Stomoxys*, *Lyperosia*, *Musca* en *Stegomyia*.' Dept. Landbouw Nederl. Indië, Veeartsenijk. Meded., No. 64, 20 pp.

[4] Sergent, Edm. and Donatien, A. 1922. 'Les stomoxes, propagateurs de la trypanosomiase des dromadaires.' C. R. Ac. Sci. Paris, CLXXIV, pp. 582–584.

1922. 'Transmission naturelle et expérimentale de la trypanosomiase des dromadaires par les stomoxes.' Arch. Inst. Pasteur Afrique du Nord, II, 3, pp. 291–315.

According to Gutberlet,[3] *Hymenolepis carioca* (Magalhaes), one of the common tapeworms of domestic fowl, has the stable-fly, *Stomoxys calcitrans* (Linnaeus), as its intermediate host. He succeeded in infecting young chicks free of parasites and kept in insect-proof cages, by feeding them large numbers of adult *S. calcitrans* caught in the yards.

G. F. Hill[4] in Australia has first shown that *Habronema microstoma* (Schneider), a nematode living as adult in the stomach of equines, has *Stomoxys calcitrans* (Linnaeus) as the normal intermediate host. The life-cycle of this parasite in the fly has been worked out more carefully in France by Roubaud and Descazeaux.[5] *Stomoxys* becomes infected in the larval stage by eating eggs of the worm. The development of the embryos proceeds exclusively in the adipose tissue of the maggot and is similar to that of *H. muscae* (Carter) in the house-fly larvae. Many of the infected maggots die, but in those that reach the adult stage, the larvae of the nematode work their way to the proboscis of the fly. The presence of the parasites in the proboscis seems to render the flies unable to pierce the skin and suck blood in the regular way. It is therefore highly improbable that *Habronema microstoma* is inoculated into the body of the definitive host by the bite of infected flics. Most likely intestinal infection occurs directly when the vertebrate host swallows adult flies containing larvae of the parasite.

Noè[6] believes that *Stomoxys calcitrans* (Linnaeus) is the intermediate host of *Setaria labiato-papillosa* (Alessandrini), a nematode of the blood of cattle and deer, but he has actually given no experimental proof that such is the case. He merely found, in Italy, three to four per cent of the adult *Stomoxys* infected with a *Filaria*, which he assumes is the larva of *Setaria labiato-papillosa*. This larval nematode was described many years ago, from the proboscis of *S. calcitrans* in Germany, as *Filaria stomoxeos* O. v. Linstow (1875, Arch. f. Naturgesch., XLI, 1, p. 195, Pl. III, figs. 20–22).

Stomoxys is essentially a genus of the tropical and subtropical parts of the Old World, whence one species, *S. calcitrans* (Linnaeus), has been widely spread by the agency of man. In Africa the genus is unusually well represented by the following eighteen species:

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[1] Donatien, A. and Lestoquard, F. 1923. 'Le debab naturel du chien. Transmission par les stomoxes.' Bull. Soc. Path. Exot., Paris, XVI, pp. 168–170.

[2] See also Austen's remarks, on *Stomoxys* as a disease-carrier, in 1909, 'Illustr. African Blood-Suck. Flies,' pp. 148–153.

[3] Gutberlet, J. E. 1919. 'On the life history of the chicken cestode, *Hymenolepis carioca* (Magalhaes).' Jl. of Parasitology, VI, pp. 35–38, Pl. IV.

[4] Hill, G. F. 1918. 'Relationship of insects to parasitic diseases in stock.' Proc. Roy. Soc. Victoria, (N.S.) XXXI, pt. 1, pp. 11–107, Pls. II–VIII.

[5] Roubaud, E. and Descazeaux, J. 1922. 'Evolution de l'*Habronema muscae* Carter chez la mouche domestique et de l' *H. microstomum* Schneider chez le stomoxe.' Bull. Soc. Path. Exot., Paris, XV, pp. 572-574.

1922. 'Deuxième contribution à l'étude des mouches, dans leurs rapports avec l'évolution des Habronèmes d'équidés.' *Loc. cit.*, XV, pp. 978–1001).

[6] Noè, G. 1903. 'Studî sul ciclo evolutivo della *Filaria labiato-papillosa* Alessandrini.' Atti R. Accad. Lincei, Roma, Rendic. Cl. Sci. Fis. Mat. Nat., (5) XII, pt. 2, No. 9, pp. 387–393.

1. *S. bilineata* Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 89 (♀; Tanganyika Territory). Stein (1909, Tijdschr. v. Entom., LII, p. 218) regards this as possibly identical with *S. brunnipes* Grünberg.
2. *S. boueti* Roubaud. See below.
3. *S. bouffardi* Picard, 1907, Bull. Soc. Ent. France, p. 27 (♀ ♂; Bamako, French Sudan). According to Austen, this species is unrecognizable.
4. *S. bouvieri* Roubaud. See below.
5. *S. brunnipes* Grünberg. See below.
6. *S. calcitrans* (Linnaeus). See below.
7. *S. hovas* Brauer, 1899, Sitzungsber. Ak. Wiss. Wien, Math.-Naturw. Cl., CVIII, p. 517 (♀; Madagascar; based upon *S. geniculatus* Bigot, 1859, Ann. Soc. Ent. France, (3) VII, p. 537; not of Macquart, 1845).
8. *S. inornata* Grünberg. See below.
9. *S. nigra* Macquart. See below.
10. *S. ochrosoma* Speiser. See below.
11. *S. omega* Newstead. See below.
12. *S. pallida* Roubaud, 1911, Bull. Soc. Path. Exot., Paris, IV, p. 125 (♀ ♂; Agouagon, Dahomey).
13. *S. rhodainica* Roubaud. See below.
14. *S. sexvittata* Roubaud, 1911, Bull. Soc. Path. Exot., Paris, IV, p. 396 (♀ ♂; banks of the Niger, between Rarimama and Niamey, French Sudan).
15. *S. sitiens* Rondani, 1873, Ann. Mus. Civ. Genova, IV, p. 288 (♂; Keren, Abyssinia). This is rather doubtfully distinct from *S. brunnipes* Grünberg.
16. *S. taeniata* Bigot. See below.
17. *S. transvittata* Villeneuve, 1916, Ann. South African Mus., XV, p. 453 (♀; Durban, Natal).
18. *S. varipes* Bezzi. See below.

Although the species of *Stomoxys* are fierce blood-suckers, both sexes, even of *S. calcitrans*, are occasionally found visiting flowers. In the Belgian Congo I have noted that various species are particularly fond of the sweet droplets excreted by the nectaries at the base of the leaf-blade of *Urena lobata* Linnaeus var. *reticulata* Guerke, a common malvaceous weed of tropical Africa (J. Bequaert, 1913, Rev. Zool. Afric., III, p. 3).

Stomoxys calcitrans (Linnaeus)

Conops calcitrans Linnaeus, 1758, 'Syst. Nat.', 10th ed., I, p. 604 (no sex given; on cattle; without locality).

Stomoxys calcitrans Geoffroy, 1764, 'Hist. Abrégée des Insectes,' II, p. 539, Pl. XVIII, fig. 2. Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 87 (♀ ♂); 1907, 'Die Blutsaugenden Dipteren,' p. 157, fig. 114 (♀ ♂). Newstead, Dutton and Todd, 1907, Ann. Trop. Med. Paras., I, p. 75. Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 142, Pl. XIII, fig. 102 (♀). J. Bequaert, 1913, Rev. Zool. Afric., III, p. 1. Bezzi, 1911, Arch. de Parasitologie, XV, pp. 124 and 138. Roubaud and Van Saceghem, 1916, Bull. Soc. Path. Exot., Paris, IX, p. 766.

Musca pungens de Geer, 1776, 'Mém. pour Servir à l'Hist. des Ins.,' VI, p. 78, Pl. IV, figs. 12–18 (Europe).

Stomoxys tessellata Fabricius, 1794, 'Ent. Syst.,' IV, p. 395 (Kiel, Germany).

Stomoxys geniculata Macquart, 1845, 'Dipt. Exot.,' Suppl. I, p. 192 (♀; Brazil).

Stomoxys nebulosa Fabricius, 1805, 'Syst. Antliat.,' p. 282 (Antilles). Berg, 1899, Comunic. Mus. Nac. Buenos Aires, I, 4, p. 124.

Stomoxis pungens Robineau-Desvoidy, 1830, 'Essai sur les Myodaires,' p. 386 (La Rochelle, France).

Stomoxis sugillatrix Robineau-Desvoidy, 1830, *loc. cit.*, p. 386 (Brazil).

Stomoxis aculeata Robineau-Desvoidy, 1830, *loc. cit.*, p. 386 (France).

Stomoxis dira Robineau-Desvoidy, 1830, *loc. cit.*, p. 387 (North America).
Stomoxis infesta Robineau-Desvoidy, 1830, *loc. cit.*, p. 387 (Saint-Sauveur, France).
Stomoxis inimica Robineau-Desvoidy, 1830, *loc. cit.*, p. 387 (North America).
Stomoxis libatrix Robineau-Desvoidy, 1830, *loc. cit.*, p. 387 (Coromandel, India).
Stomoxis claripennis Robineau-Desvoidy, 1863, 'Hist. Nat. Dipt. Env. Paris,' II, p. 604 (♂; vicinity of Paris, France).
Stomoxis chrysocephala Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 604 (♀♂; vicinity of Paris, France).
Stomoxis vulnerans Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 605 (♀; vicinity of Paris, France).
Stomoxis flavescens Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 605 (♂; vicinity of Paris, France).
Stomoxis minuta Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 606 (♀; vicinity of Paris, France).
Stomoxis rubrifrons Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 606 (♂; vicinity of Paris, France).
Stomoxis cunctans Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 607 (♀; Nice, France).
Stomoxis aurifacies Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 607 (♀; Nice, France).
Stomoxis praecox Robineau-Desvoidy, 1863, *loc. cit.*, II, p. 608 (♂; Nice, France).
Stomoxys korogwensis Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 88 (♂; Korogwe, Tanganyika Territory). Patton, 1925, Philippine Jl. Sci., XXVII, p. 190.
Stomoxys calcitrans var. *korogwensis* J. Bequaert, 1913, Rev. Zool. Afric., III, p. 1.
Stomoxys calcitrans var. *soudanense* Roubaud, 1911, Bull. Soc. Path. Exot., Paris, IV, pp. 397 and 545 (♀♂; French Sudan, in the region of the Upper Niger).
Musca occidentis Walker, 1852, 'Insecta Saundersiana,' I, Dipt., p. 332 (♀; United States).

Canary Islands. — Las Mercedes near Sa. Cruz de Tenerife, biting oxen and donkeys, June 29, 1926.

Liberia. — Monrovia, July 1926. Mt. Barclay Plantation, biting horse, July 20, 1926. Lenga Town, biting dog, August 14, 1926.

Belgian Congo. — Kisenyi, February 1927. Kamaniola, February 1, 1927.

This species, known as the stable-fly, was originally at home in the Old World; but, through the agency of man, it has now become practically cosmopolitan. It is very common throughout Africa and extremely variable in size as well as in the extent of the abdominal markings. It is doubtful whether these variations are more than individual or seasonal, and whether any of the many names listed in the foregoing synonymy can be retained for true geographical races.

Stomoxys brunnipes Grünberg

Stomoxys brunnipes Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 89 (♂; Buea and Barombi, Cameroon; and Tanganyika Territory); 1907, 'Die Blutsaugenden Dipteren,' p. 159 (♂). Stein, 1909, Tijdschr. v. Entom., LII, p. 219 (♀♂). Bezzi, 1911, Arch. de Parasitologie, XV, pp. 125 and 138. Roubaud, 1911, Bull. Soc. Path. Exot., Paris, IV, pp. 122 and 126 (♀♂); 1925, *loc. cit.*, XVIII, p. 467. J. Bequaert, 1913, Rev. Zool. Afric., III, p. 2. Stein, 1913, Ann. Mus. Nat. Hungarici, XI, p. 476 (♂); 1918, *loc. cit.*, LXVI, p. 151 (♂). Patton, 1925, Philippine Jl. Sci., XXVII, p. 190 (♀♂).
Stomoxys sellata Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 90 (♀; Johann-Albrechtshöhe, Cameroon). Patton, 1925, Philippine Jl. Sci., XXVII, p. 190 (♂).
Stomoxys intermedia Roubaud, 1907, Ann. Inst. Pasteur, Paris, XXI, p. 666 (♀; Brazzaville, French Congo).

Belgian Congo. — Southwest of new Beni (Bungulu), Ituri Forest, three females and one male, biting buffalo, May 13, 1927 (R. P. Strong).

S. brunnipes appears to be rather widely distributed in tropical Africa, being known from Dahomey, the French Congo, the Belgian Congo (Lukonzolwa, region of Lake Kivu, and Ituri), Uganda, Eritrea, Kenya Colony, Tanganyika Territory, Northern Rhodesia, and Nyasaland. Stein has also reported it from the Oriental Region (Java; Formosa), and, if his identifications were correct, *Stomoxys oblongopunctata* Brunetti (1910, Rec. Indian Mus., IV, p. 73; ♂; Assam) may be a synonym of *S. brunnipes*.

As pointed out by Bezzi (1911, Boll. Labor. Zool. Gen. Agrar. Portici, VI, p. 98), *S. brunnipes* is perhaps only a variation of *S. sitiens* Rondani. *S. bilineata* Grünberg may also be the same species.

Stomoxys varipes Bezzi

Stomoxys varipes Bezzi, 1907, Rendic. Ist. Lombardo, (2) XL, p. 446 (♀; Asmara, Eritrea); 1908, Bull. Soc. Ent. Italiana, XXXIX, p. 104 (♀). Surcouf and Picard, 1908, Bull. Soc. Path. Exot., Paris, I, p. 197 (♂). Speiser, 1910, in Sjöstedt, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' II, 10, 5, p. 162 (♀). Stein, 1913, Ann. Mus. Nat. Hungarici, XI, p. 476 (♀).

UGANDA. — Near Kabale, one female, April 12, 1927.

This species seems to be strictly East African, being known from Eritrea, Abyssinia, Kenya Colony, Tanganyika Territory, and southwestern Uganda.

Stomoxys nigra Macquart

Stomoxys nigra Macquart, 1850, 'Dipt. Exot.,' Suppl. IV, p. 239, Pl. XXII, fig. 5 (♀; Ile Bourbon [= Réunion]; in the Index, p. 358, the locality is given as Port Natal). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 153, Pl. XIII, fig. 101 (♀). Bezzi, 1911, Arch. de Parasitologie, XV, pp. 125 and 138.

Stomoxys glauca Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 88 (♀ ♂; Cameroon and Togo); 1907, 'Die Blutsaugenden Dipteren,' p. 158 (♀ ♂). Patton, 1925, Philippine Jl. Sci., XXVII, p. 190. Stein, 1913, Ann. Mus. Nat. Hungarici, XI, p. 475 (♀ ♂).

Stomoxys lafonti Picard, 1907, Bull. Soc. Ent. France, p. 28 (♀ ♂; Mauritius).

Stomoxys sitiens Newstead, Dutton and Todd, 1907, Ann. Trop. Med. Paras., I, p. 86 (not of Rondani).

LIBERIA. — Gbanga, September 12, 1926, one male, sitting on a leaf in second-growth forest.

This species appears to be generally distributed throughout tropical Africa. There are records from Gambia, Sierra Leone, Liberia, the Gold Coast, Togo, Northern Nigeria, Southern Nigeria, Cameroon, Belgian Congo (Nouvelle-Anvers; Sendwe; Lulongo; Nyangwe; Kasongo), the Anglo-Egyptian Sudan, Abyssinia, Kenya Colony, Uganda, Zanzibar, Tanganyika Territory, Northern Rhodesia, Pemba Island, Nyasaland, and Zululand. It is also known from Réunion and Mauritius.

Stomoxys bouvieri Roubaud

Stomoxys bouvieri Roubaud, 1907, Ann. Inst. Pasteur, Paris, XXI, p. 667 (♀ ♂; Brazzaville, French Congo, and Mbamu Island, Belgian Congo); 1911, Bull. Soc. Path. Exot., Paris, IV, pp. 123 and 127 (♀ ♂). J. Bequaert, 1913, Rev. Zool. Afric., III, p. 2.

I have listed (1913) many localities of the Belgian Congo for this species; but as none of these specimens are now before me, I am unable to confirm or to correct the identifications. Moreover, I am inclined to regard *S. bouvieri* as a synonym of *S. nigra* Macquart, which Roubaud does not seem to have recognized.

S. bouvieri has been recorded from the Ivory Coast, Dahomey, French Congo, and Belgian Congo. What Roubaud describes as *S. bouvieri* var. *clara* (1907, *loc. cit.*, p. 668; ♂; Brazzaville), is possibly *S. omega* Newstead. Fortunately Newstead's name will in any case be retained, since it appeared in February 1907, while Roubaud's paper is dated July of the same year.

Stomoxys omega Newstead

Stomoxys omega Newstead, 1907, Ann. Trop. Med. Paras., I, p. 87, Pl. III, figs. 2–3 (♀ ♂; Ukungwa and Sendwe, Belgian Congo). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 157, Pl. XIII, fig. 96 (♂).

Liberia. — Du River, Camp No. 3, July 27, 1926, in the primary rain forest.

Belgian Congo. — Southwest of new Beni (Bungulu), one female, biting buffalo, May 13, 1927 (R. P. Strong).

Austen has called attention to the beautiful character exhibited by the male of this species, *viz.*, the fringe of long, fine, curled hair on the inner side of the first two segments of the fore tarsi. In the male of *S. ochrosoma* Speiser these curled hairs are found on the fore basitarsus only.

S. omega appears to be strictly West African, being known from Sierra Leone, Liberia, the Gold Coast, and the Belgian Congo. Most probably the specimens from Dahomey doubtfully referred to *S. glauca* (1911, Bull. Soc. Path. Exot., Paris, IV, pp. 124 and 126) were really *S. omega* Newstead, a species which was unknown to Roubaud.

Stomoxys boueti Roubaud

Stomoxys boueti Roubaud, 1911, Bull. Soc. Path. Exot., Paris, IV, pp. 124 and 127 (♀ ♂; Agouagon, Dahomey).

Liberia. — Kasata, September 1926. Gbanga, September 1926.

This species is known only from Dahomey and Liberia. It is remarkable for its small size, being only 3 to 5 mm. in total length.

Stomoxys inornata Grünberg

Stomoxys inornata Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 90, fig. 15 (♀ ♂; Buea, Cameroon); 1907, 'Die Blutsaugenden Dipteren,' p. 159 (♀ ♂). Austen, 1909, 'Illustr. African Blood-Suck. Flies,' p. 159, Pl. XIII, fig. 97 (♀). Roubaud, 1907, Ann. Inst. Pasteur, Paris, XXI, p. 666; 1911, Bull. Soc. Path. Exot., Paris, IV, pp. 125 and 127 (♀ ♂). Patton, 1925, Philippine Jl. Sci., XXVII, p. 190 (♂).

Liberia. — Bakratown, September 30, 1926. Banga, October 25, 1926, in dense virgin rain forest. Paiata, October 1926.

This species appears to be strictly West African and has been reported from Liberia, the Gold Coast (Ashanti), Cameroon, and the French Congo.

Stomoxys taeniata Bigot

Stomoxis taeniatus Bigot, 1887, Bull. Soc. Zool. France, XII, p. 594 (♀; Port Natal).

Stomoxys taeniata Surcouf and Picard, 1908, Bull. Soc. Path. Exot., Paris, I, p. 197 (♂). Bezzi, 1908, Bull. Soc. Ent. Italiana, XXXIX, p. 103. Speiser, 1910, in Sjöstedt, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' II, 10, 5, p. 162 (♀). Neave, 1912, Bull. Ent. Res., III, pp. 315, 317 and 320. J. Bequaert, 1913, Rev. Zool. Afric., III, p. 2. Stein, 1913, Ann. Mus. Nat. Hungarici, XI, p. 476 (♀ ♂).

I have recorded this species from Elisabethville and Sankisia, in the Katanga District of the Belgian Congo; but the specimens in question are not now before me.

S. taeniata appears to be an East-and-South African species, known at present from Eritrea, Abyssinia, Kenya Colony, Tanganyika Territory, the Katanga, Nyasaland, and Natal.

Stomoxys rhodainica Roubaud

Stomoxys rhodainica Roubaud, 1925, Bull. Soc. Path. Exot., Paris, XVIII, p. 468, fig. 2 (♀♂; Kibati, north of Lake Kivu, Belgian Congo).

Belgian Congo. — Mai Ivwi (north of Ruchuru), alt. about 1,100 m., March 3, 1927, three males biting buffalo (R. P. Strong).

Stomoxys ochrosoma Speiser

Stomoxys ochrosoma Speiser, 1910, in Sjöstedt, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' II, 10, 5, p. 162 (♀; Kibonoto, Kilimanjaro, Tanganyika Territory). Roubaud, 1925, Bull. Soc. Path. Exot., Paris, XVIII, p. 467 (♀).

Belgian Congo. — Mai Ivwi (north of Ruchuru), alt. 1,200 m., March 3, 1927, one male biting buffalo (R. P. Strong).

The first females of this species were supposedly taken by Sjöstedt hovering over the columns of driver-ants. Dr. J. Rodhain found a female biting a mule in the hills of Luvungi (south of Lake Kivu; alt. 1,500 m.).

Male (undescribed). — Similar in coloration to the female, but the dorsum of the thorax with a broad median black stripe, slightly widened anteriorly and posteriorly and narrowly interrupted at the transverse suture. Wings uniformly ash-gray with a yellowish tinge. Frons moderately wide and almost parallel-sided. Fore basitarsus with a dense fringe of peculiar, curled, hook-like bristles; the second and following segments of fore tarsi without curved hairs. Length, 6.5 mm.; of wing, 7.5 mm.; of proboscis, 4 mm.

Stygeromyia Austen

Stygeromyia Austen, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 445. Monotypic for *Stygeromyia maculosa* Austen, 1907.

So far as known, this genus occurs only in Africa and Arabia, whence the following five species have been described:

1. *S. maculosa* Austen, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 447 (♂; Little Aden, Southern Arabia).
2. *S. rufipalpis* (Becker) = *Lyperosia rufipalpis* Becker, 1910, Denkschr. Ak. Wiss. Wien, Math.-Naturw. Kl., LXXI, p. 148 (♂; Ras Fartak, Socotra). According to Bezzi, this is possibly the same as *S. maculosa* Austen.
3. *S. sanguinaria* Austen. See below.
4. *S. thirouxi* (Roubaud) = *Lyperosia thirouxi* Roubaud, 1906, C. R. Soc. Biol., Paris, LX, p. 896, fig. 1 (♀♂; St. Louis, Senegal). At Dakar, crithidial flagellates have been found in one specimen of *S. thirouxi* that had fed on horses. It is, however, unknown whether they were specific parasites of the fly or represented stages in the evolution of a trypanosome of vertebrates (M. Léger, 1922, C. R. Soc. Biol., Paris, LXXXVII, pp. 134–136).
5. *S. woosnami* Austen, 1912, Bull. Ent. Res., III, p. 97 (♂; plateau above Naivasha, Kenya Colony).

Stygeromyia sanguinaria Austen

Stygeromyia sanguinaria Austen, 1909, Ann. Mag. Nat. Hist., (8) III, p. 286 (♀ ♂; Ruwe, Belgian Congo, and Monkey Bay, Lake Nyasa); 1909, 'Illustr. African Blood-Suck. Flies,' p. 137.

This species is known only from the holotype (♂), from the Katanga District of the Belgian Congo, and allotype (♀), from Nyasaland.

Bdellolarynx Austen

Bdellolarynx Austen, 1909, Ann. Mag. Nat. Hist., (8) III, p. 290. Monotypic for *Bdellolarynx sanguinolentus* Austen, 1909.

Haematobia Robineau-Desvoidy, 1830, 'Essai sur les Myodaires,' p. 388 (not of Lepeletier and Serville). Brauer and v. Bergenstamm, 1889, Denkschr. Ak. Wiss. Wien, Math.-Naturw. Cl., LVI, p. 155 (select *Stomoxys stimulans* Meigen, 1824, as type). Patton, 1925, Philippine Jl. Sci., XXVII, p. 189. Séguy, 1923, 'Faune de France, Diptères, Anthomyides,' p. 343.

Lyperosiops C. H. T. Townsend, 1912, Proc. Ent. Soc. Washington, XIV, p. 47. Type by original designation: *Stomoxys stimulans* Meigen, 1824.

? *Bdellia* Enderlein, 1928, Zeitschr. Angew. Entom., XIV, 2, p. 359. Monotypic for *Bdellia praedatrix* Enderlein, 1928.[1]

I have tentatively followed Patton (1925) and Malloch (1928) in regarding *Stomoxys stimulans* Meigen as not generically separable from *Bdellolarynx sanguinolentus* Austen. If this procedure is correct, the genus *Bdellolarynx* is widely distributed in the Old World. Malloch has also described a species from South America. Two African species appear to belong here:

B. (?) *praedatrix* (Enderlein) = *Bdellia praedatrix* Enderlein, 1928, Zeitschr. Angew. Entom., XIV, 2, p. 360, figs. 2–3 (♀ ♂; Bomana and Bibundi, Cameroon).

B. squalida (Grünberg) = *Haematobia squalida* Grünberg, 1913, Entom. Rundschau, XXX, pp. 126 and 132 (♂; Bulia, Tanganyika Territory; misspelled "*soualida*" on p. 126). *Haematobia lutosa* Patton, 1925, Philippine Jl. Sci., XXVII, p. 189 (♂, "Kenya Colony"; this was evidently the type of *H. squalida*, since Grünberg described no other African species in this genus, and Patton credits the name "*lutosa*" to that author).

Haematobia Lepeletier and Serville

Haematobia Lepeletier and Serville, 1828, 'Encyclop. Méthod., Insectes,' X, 2, p. 499. Type by designation of Westwood, 1840, 'Introd. Modern Classif. Insects,' II, Synopsis, p. 140: *Conops irritans* Linnaeus, 1758.

Lyperosia Rondani, 1856, 'Dipter. Ital. Prodr.,' I, p. 93. Monotypic for *Conops irritans* Linnaeus, 1758.

Priophora Robineau-Desvoidy, 1863, 'Hist. Nat. Dipt. Env. Paris,' II, p. 611. Monotypic for *Haematobia serrata* Robineau-Desvoidy, 1830 = *Conops irritans* Linnaeus, 1758.

Glossinella Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 84. Monotypic for *Glossinella schillingsi* Grünberg, 1906.

Haphospatha Enderlein, 1924, Konowia, III, p. 51; 1928, Zeitschr. Angew. Entom., XIV, 2, pp. 357 and 363. Monotypic for *Haphospatha hirudo* Enderlein, 1924.

The characters used by Enderlein (1928) to separate *Haematobia, Glossinella,* and *Haphospatha* are hardly even of subgeneric value. The following seven Ethiopian species belong to *Haematobia* as here understood:

1. *Haematobia hirudo* (Enderlein) = *Haphospatha hirudo* Enderlein, 1924, Konowia, III, p. 52 (♀ ♂; Kuti, Ntem and Banje Riben; all in Cameroon).

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[1] Since Enderlein does not tell whether the propleura and hypopleura are bare or hairy, it is impossible to decide from his description whether *Bdellia* is a synonym of *Bdellolarynx* or of *Haematobosca.*

2. *Haematobia minuta* (Bezzi) = *Lyperosia minuta* Bezzi, 1892, Ann. Mus. Civ. Genova, XXXII, p. 192 (♀♂; Obbia, Somaliland). *Lyperosia longipalpis* Roubaud, 1906, C. R. Soc. Biol., Paris, LX, p. 896, fig. 2 (♀♂; St. Louis, Senegal).
3. *Haematobia pallidipes* (Roubaud). See below.
4. *Haematobia potans* (Bezzi) = *Lyperosia potans* Bezzi, 1907, Rendic. Ist. Lombardo, (2) XL, p. 456 (♀; Eritrea).
5. *Haematobia potrix* (Enderlein) = *Glossinella potrix* Enderlein, 1928, Zeitschr. Angew. Entom., XIV, 2, p. 362, fig. 6 (♀♂; Socotra).
6. *Haematobia punctigera* (Austen) = *Lyperosia punctigera* Austen, 1909, Ann. Mag. Nat. Hist., (8) III, p. 285 (♀; Nile Province, Uganda); 1909, 'Illustr. African Blood-Suck. Flies,' p. 162, Pl. XIII, fig. 103 (♀).
7. *Haematobia schillingsi* (Grünberg). See below.

As pointed out by Roubaud (1911, Bull. Soc. Path. Exot., Paris, IV, p. 547), the species of *Haematobia* are more strictly parasitic than those of *Stomoxys* and *Glossina*. They hardly leave the body of their host, except for oviposition, and show a tendency to become true ectoparasites (like the Hippoboscidae). The vernacular name "horn-fly," given in North America to *H. irritans* (Linnaeus), refers to the habit of clustering in large numbers around the base of the horns of cattle. The larvae of *Haematobia* live in freshly deposited manure of herbivorous mammals, especially cattle and buffalo.

Haematobia schillingsi (Grünberg)

Glossinella schillingsi Grünberg, 1906, Zoolog. Anzeiger, XXX, p. 86, figs. 11–14 (♀♂; Donje Erok and Keitloa, Tanganyika Territory). Enderlein, 1928, Zeitschr. Angew. Entom., XIV, 2, p. 362, fig. 4.
Lyperosia schillingsi Austen, 1926, Bull. Ent. Res., XVI, p. 307.

Belgian Congo. — Northeastern Uele District, numerous specimens biting white rhinocerous (J. Rodhain).

These specimens agree well with Grünberg's and Enderlein's accounts of this species. The palpi are slender throughout, even more so than figured by these authors. I follow Austen in regarding *H. schillingsi* as specifically distinct from *H. minuta* (Bezzi). Grünberg's types likewise were taken upon rhinoceros.

Haematobia pallidipes (Roubaud)

Lyperosia pallidipes Roubaud, 1907, Ann. Inst. Pasteur, Paris, XXI, p. 669 (♀♂; Brazzaville, French Congo). Roubaud and Van Saceghem, 1916, Bull. Soc. Path. Exot., Paris, IX, p. 766.
Haphospatha pallidipes Enderlein, 1928, Zeitschr. Angew. Entom., XIV, 2, pp. 364 and 367.

Van Saceghem has taken this species at Zambi, in the estuary of the Congo. It is known only from the western part of the French and Belgian Congo.

GLOSSINIDAE

J. R. Malloch (1929, Ann. Mag. Nat. Hist., (10) III, p. 553) has recently given some reasons why the genus *Glossina* should, in his opinion, be made the type of a distinct family, Glossinidae.[1] He calls attention to the fact that the abdominal spiracles are clearly placed in the membrane between the tergites and sternites, while in the other calyptrate Muscoidea (with the exception of the Gasterophilinae), they are placed in the second to fifth tergites. Furthermore, the chitinized prosternal plate is lacking, and the metasternum has a unique development, being on a level with the mesosternum and projecting forward so as to separate the mid-coxae. Malloch suggests that these peculiarities are perhaps correlated with the highly specialized and strictly blood-sucking habits of tsetse-flies, while the development of strong bristles on the bases of the fore coxae may help protect the swollen base of the proboscis.

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[1] The tsetse-flies were first separated into an independent family, Glossinidae, by Cockerell, 1908, Bull. Amer. Mus. Nat. Hist., XXIV, p. 65. This author, however, did not point out the family characters. Bezzi (1911, Arch. de Parasitologie, XV, p. 113) regarded the tsetse-flies as forming a distinct subfamily Glossininae of the Muscidae, of the same taxonomic value as the Muscinae and Stomoxydinae.

The tsetse-flies show a number of additional, important characters that set them off from the other Muscoidea Calyptrata. The feathered or plumose hairs of the antennal arista are unique among the Muscoidea. The unusual course of the fourth longitudinal vein of the wing, with its strong downward bend before the strongly oblique anterior transverse vein, is also unparalleled in the group.

The proboscis is very highly specialized, consisting of a swollen basal bulb and an extremely slender needle-like rod (which includes the labium, labrum, and hypopharynx). At rest it is completely ensheathed by the long and slender palpi. While the proboscis is built essentially like that of the other blood-sucking Muscoidea, its finer structure is separated by a broad gap from that of the nearest relative, *Stomoxys*. The females are pupiparous [1] and as a result their genital organs are profoundly modified. The male genital armature is completely hidden within the hypopygium or peculiarly modified eighth abdominal segment.

The tsetse-flies have generally been placed in the subfamily Stomoxydinae of the Muscidae. While it is true that they show more similarity to *Stomoxys* than to any other living genus of flies, it is doubtful whether this is indicative of any true relationship. Considering the high antiquity of the genus *Glossina*, which during Miocene times was represented by several species seemingly as highly specialized as any living at present, there is every reason to believe that it forms a distinct off-shoot in the evolution of the Calyptrata. *Stomoxys* and its relatives, *Haematobia*, *Stygeromyia*, *Bdellolarynx*, and *Haematobosca*, are most probably a much more recent branch of the *Musca* stock, having no genetic relation with *Glossina*.

Attention may be called here to a hatched puparium of a muscid fly which was found under dry leaves in a forest clearing at Camp No. 3, on the Du River, Liberia. This puparium agrees with that of a tsetse-fly in size and in bearing at the posterior extremity a pair of almost spheroidal lobes separated by a narrow, but deep, notch. That this puparium is, however, not of a species of *Glossina* is shown by several peculiarities. The several segments are clearly set off by slight constrictions. The external surface is not uniformly dull and shagreened, but rather smooth and shiny (at any rate under a handlens) and provided with regular transverse and longitudinal rows of pits. Finally, the anal lobes are not thickly studded with papillae (as in *Glossina*), but are mostly smooth with a series of meandering impressed lines evidently representing the much branched three slits or "peritremes" of the stigmal plates; a pit-like depression at the summit of each lobe represents the "button" or scar of the posterior stigmata of an earlier larval stage; the stigmal plates of this pupa belong, therefore to the "brain-coral type" of C. T. Greene (1921, Proc. U. S. Nat. Mus., LX, Art. 10, p. 2). It may also be pointed out that the so-called "polypneustic lobes" of the adult larvae and pupae of *Glossina* are really an extreme development of the "brain-coral type" ramification of the respiratory slits or "peritremes" which are found on the stigmal plates of the other muscoid flies. The two so-called "posterior stigmata" or "paired abdominal stigmata," described by Roubaud, Stuhlmann, Newstead and others as situated within the deep pit enclosed by the inner lips of the two lobes, evidently represent the "buttons," or vestigial scars of the posterior stigmata of an earlier larval stage ("Stigmennarbe" of J. C. H. de Meijere, 1895, Tijdschr. v. Entom., XXXVIII, p. 68).

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[1] While the female tsetse-flies actually deposit full-grown larvae and not pupae, it seems nevertheless more appropriate to call them pupiparous rather than larviparous, so as to distinguish their case from that of the many Diptera which deposit young larvae, freshly hatched from the eggs.

Glossina Wiedemann

Glossina Wiedemann, 1830, 'Aussereurop. Zweifl. Insekt.,' II, p. 253. Monotypic for *Glossina longipalpis* Wiedemann, 1830.

Nemorhina Robineau-Desvoidy, 1830, Mém. Divers Savans Ac. Sci. Inst. France, Sci. Math. Phys., II, p. 389. Monotypic for *Nemorhina palpalis* Robineau-Desvoidy, 1830.

Austenina C. H. T. Townsend, 1921, Insecutor Inscit. Menstr., IX, p. 132. Monotypic for *Glossina brevipalpis* Newstead, 1910.

Newsteadina C. H. T. Townsend, 1921, Insecutor Inscit. Menstr., IX, p. 133. Monotypic for *Stomoxys fuscus* Walker, 1849.

The genus *Glossina* comprises some nineteen or twenty species, which are the notorious tsetse-flies of Africa. Nowadays the genus is restricted to the Ethiopian Region, where it is found from the Senegal and the Anglo-Egyptian Sudan to Benguela in the west and Zululand in the east. One species also occurs in the extreme southwestern corner of Arabia. During former geological times the genus *Glossina* had undoubtedly a much wider range, as is shown by its presence in a fossil condition in the Miocene shales of Colorado. But for probably several million years the tsetse-flies have been extinct in the New World and it is most improbable that they could at present become acclimatized in North America.

So much has been written concerning the habits of tsetse-flies that it hardly seems worth while to record one's own observations. A complete review of the whole subject of "glossinology" is now being compiled by my industrious friend, Mr. Emile Hegh, of the Belgian Colonial Office.[1] There are, however, two points on which I cannot agree with most authors. The first relates to the noise made by these flies. It is often stated that tsetse-flies make a buzzing noise *when in flight* and that the vernacular name "tsetse," given to *G. mor-*

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[1] Hegh, E. 1929. 'Les Tsé-tsés. Tome I. Généralités. Anatomie. Systématique. Reproduction. Gîtes à pupes. Ennemis prédateurs et parasites.' (Brussels), xiv + 742 pp., with numerous plates. A second volume, now in preparation, will deal with the distribution, habits and methods of control.

sitans by certain South African natives, was an imitation, or onomatopoeia, of this buzz.[1] In my experience, *Glossina palpalis*, at any rate, has a perfectly noiseless flight and it alights or flies off without giving much warning to its victim. So far as I remember, the other species of *Glossina*, including *G. morsitans*, make no appreciable noise *in flight.* All tsetse-flies, however, make at times a high, shrill, singing noise, *when resting*, before or after feeding. It is possible that where *G. morsitans* is very abundant this singing of the resting flies might have been attributed to the numerous flying individuals.

It has also sometimes been stated that the bite of tsetse-flies is unusually painful and that when a fly is infected with trypanosomes the spot where it bites will swell up and become inflamed. The immediate reaction to the bite I have personally found to be extremely variable; sometimes it was felt at once, but frequently it was entirely overlooked. I have reached the conclusion that many factors influence the reaction of man or animals to the bite, such as individual sensibility, the distance of the bite from a nerve, the temperature, the number of flies, etc. I have often observed *G. palpalis* completing its meal on the leg of a native without being in the least disturbed. As a rule, the subsequent reaction of the tissues surrounding the bite is very slight and of short duration; sometimes there is a little swelling and very rarely the bite is followed by considerable oedema, persisting for a long time. On one occasion near Nyangwe, in the Belgian Congo, in December 1910, my entire left hand was very badly swollen for several days following the bite of a single *G. palpalis*. Yet there has never been any sign that I had become infected with trypanosomiasis. I am in agreement with Dr. J. Schwetz (1912, Rev. Zool. Afric., I, 3, p. 457) that the symptoms following the bite of a tsetse give no clue as to the possibility of infection with trypanosomes.

Five species of tsetse-flies have been recorded thus far from Liberia, *viz.*, **Glossina palpalis* (Robineau-Desvoidy), **G. fusca* (Walker), **G. pallicera* Bigot, **G. nigrofusca* Newstead, and *G. medicorum* Austen. Four of these were found by the Harvard African Expedition.[2]

The genus is much more abundantly represented in the Belgian Congo by no less than thirteen species, as follows: **G. palpalis* (Robineau-Desvoidy), *G. newsteadi* Austen (1929, Bull. Ent. Res., XX, 1, p. 1), **G. fusca* (Walker), *G. tabaniformis* Westwood, **G. morsitans* Westwood (with the race *submorsitans* Newstead), *G. longipalpis* Wiedemann, **G. pallidipes* Austen, **G. brevipalpis* Newstead, **G. fuscipleuris* Austen, *G. pallicera* Bigot, **G. schwetzi* Newstead and Evans, *G. haningtoni* Newstead and Evans, and *G. severini* Newstead.

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[1] The whole subject is discussed at length by Hegh (1929, *loc. cit.*, pp. 19–21). Austen (1903, 'Monograph of the tsetse-flies,' p. 1, footnote), however, writes more cautiously that the word tsetse "owes its origin to the peculiar buzzing sound made by the fly on the wing or when commencing to suck blood."

[2] In this and the following enumeration asterisks designate the species of which I have seen specimens from the territories under consideration.

Glossina palpalis (Robineau-Desvoidy)

Nemorhina palpalis Robineau-Desvoidy, 1830, Mém. Divers Savans Ac. Sci. Inst. France, Sci. Math. Phys., II, p. 390 (no sex given; Congo).

Glossina palpalis Austen, 1903, 'Monograph of the Tsetse-flies,' p. 71, Pl. I (♀ ♂). Hegh, 1929, 'Les Tsé-tsés,' I, pp. 247 and 363, Pls. I and II and fig. 221*A* (♀ ♂, pupa).

Glossina ventricosa Bigot, 1885, Ann. Soc. Ent. France, (6) V, pp. 122 and 123 (doubtfully given as a ♀ and as from Australia).

Glossina palpalis wellmani Austen, 1905 (April), Ann. Mag. Nat. Hist., (7) XV, p. 390 (♀ ♂; Katumbela River, Portuguese West Africa).

Glossina bocagei França, 1905 (May), Jl. Sci. Math. Phys. Nat. Ac. Lisboa, (2) VII, No. 27, p. 134 (Quanza River, Portuguese West Africa).

Glossina maculata Newstead, 1907, Ann. Trop. Med. Paras., I, p. 73, Pl. III, figs. 5–6 (♀; Tshumbiri, Belgian Congo).

Glossina fuscipes Newstead, 1910, Ann. Trop. Med. Paras., IV, p. 375 (♂; Nimule, Uganda).

Glossina ziemanni Grünberg, 1912, Sitzungsber. Ges. Naturf. Fr. Berlin, p. 246 (♀ ♂; Mina, River Mbam, Cameroon).

Glossina palpalis var. *pallida* Simpson, 1918, Bull. Ent. Res., VIII, p. 197 (no sex given; Yapi, in the Northern Territories of the Gold Coast).

Liberia. — Kolobanu, October 19, 1926. Lenga Town, biting man in the resthouse of the town, August 15, 1926. Moala, October 31, 1926. Banga, October 1926. Paiata, October 1926. Bakratown, October 1926. Memmeh Town, August 29, 1926. Reppo's Town, September 1926. Du River, Camp No. 3, August 1926. Kaka Town, August 20, 1926. All the numerous specimens examined in Liberia showed the typical coloration of the species.

In addition, *G. palpalis* occurs in most of the creeks near Monrovia, as well as in those of the lower Du (or Dukwa) River. According to Dr. Bouet, it is also found along the densely wooded sea-shore of Cape Mesurado. I have formerly called attention to its occurrence at the sea-shore on the cliffs of Landana, Portuguese Congo (1915, Bull. Soc. Path. Exot., Paris, VIII, p. 463).

Belgian Congo. — It seems unnecessary to enumerate localities for this territory, where *G. palpalis* is unusually abundant along the Congo River. At Uvira, on the northern shore of Lake Tanganyika, I have taken specimens with the typical coloration of the species.

During the Expedition's stay at Lake Kivu and in the region of the Virunga Volcanoes, special attention was paid to the possible occurrence of tsetse-flies in that region, but no specimens of any species of *Glossina* were ever seen. I am quite positive that no tsetse-flies are to be found there above the altitude of 1,400 m., an opinion which is shared by my friend, Mr. René Van Saceghem, who has resided several years in the Kivu region, as well as by Dr. J. Rodhain.[1] It is unfortunate that Roubaud has given his authority to the supposed discovery by Cronier of *G. palpalis* in the Kivu Volcanoes at altitudes of 1,500 m. and 3,000 m. (1913, Bull. Soc. Path. Exot., Paris, VI, p. 349). The total absence of tsetse-flies from these higher regions of the eastern Belgian Congo is, of course, of considerable practical importance since it is one of the greatest economic assets of that territory.

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[1] Bequaert, J. 1915. 'Notes sur la dispersion des glossines au Congo belge.' Bull. Soc. Path. Exot., Paris, VIII, pp. 463–466.

Van Saceghem, R. 1924. 'Note sur la dispersion des glossines au Kivu.' Ann. Soc. Belge Méd. Tropic., IV, 2, p. 177.

Rodhain, J. 1919. 'La limite septentrionale de l'aire de dispersion de la *Glossina morsitans* entre le Lualaba et le lac Tanganyika.' Rev. Zool. Afric., VII, 1, pp. 57–64.

As is often the case with insects that have a very wide distribution, *G. palpalis* exhibits much individual variation. Since these insects have been collected by very many people in innumerable specimens, such variations have not failed to attract attention. I have included in the above synonymy the several names which have been proposed for some of these forms. It is doubtful whether any of them are sufficiently distinct to be worthy of recognition, except as varieties, as none of them appear to be geographically segregated.

One of the best recognizable of these forms is the small var. *pallida* Simpson, of the forest galleries in the savanna country of the Northern Territories of the Gold Coast.[1] At the other extreme of the range, in Benguela, one also finds a smaller form, var. *wellmani* Austen (*bocagei* França), but in this case the gray markings show a decided tendency to disappear. The var. *fuscipes* Newstead differs, according to Newstead, slightly in the structure of the male genitalia. It is sometimes stated to be the form of Uganda, that is of the eastern part of the general range of the species. Newstead, however, synonymizes with it *G. ziemanni* Grünberg, of Cameroon, which cannot well be regarded as "eastern." In this connection it must be kept in mind that the type locality of *G. palpalis* was the Congo.

Glossina pallicera Bigot

Glossina pallicera Bigot, 1891, Ann. Soc. Ent. France, LX, p. 378 (described as ♀, but actually a ♂; Assinie, Ivory Coast). Austen, 1903, 'Monograph of the Tsetse-flies,' p. 79, Pl. II (♀ ♂). Hegh, 1929, 'Les Tsé-tsés,' I, pp. 257 and 375, Pl. IV (♀ ♂).

LIBERIA. — Betala, October 13, 1926. Reppo's Town, September 1926. Banga, October 1926. Kaka Town, August 20, 1926. Bomboma near Moala, October 31, 1926. According to Dr. Bouet, this species also occurs in the region of the Mt. Barclay Plantation.

Newstead, Evans and Potts (1924, Liverpool School Trop. Med., Memoir, N. S., No. 1, p. 162) record this species from Tappoima, Liberia. It is a West African tsetse-fly, chiefly found in Upper Guinea (from Sierra Leone to Cameroon). Outside of this range there are a few isolated records from the Belgian Congo: Sankuru River, between Pania Mutombo and Lusambo; Mbila near Kisengwa; Uele Region; and Zambo (a locality unknown to me). It seems to me that these Congo records need confirmation. They may perhaps have been based upon immature specimens of some other species of *Glossina* or upon examples, the antennae of which were accidentally discolored by some preservative.

The habits of *G. pallicera* are very different from those of *G. palpalis*. It is essentially a species of the dense, primary rain forest, but it is by no means partial to water courses. In Liberia it is usually met with along the narrow, shaded forest paths where it suns itself on leaves or fallen tree trunks, resting more rarely on the bare ground. It is never found in large numbers, is strictly diurnal and is not prone to attacking man. At Kaka Town, during a heavy rainstorm, I have taken a few specimens attempting to bite man under the open thatched shack that served as a resthouse. *G. pallicera* was seen to bite only during the daytime. Its flight is as silent as that of *G. palpalis;* but, when at rest, it often makes a high-pitched "peeping" noise.

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[1] If Simpson's var. *pallida* is worthy of recognition in nomenclature, it will have to be renamed, since the name is preoccupied in the genus by the earlier *Glossina morsitans* var. *pallida* Shircore, 1913, Bull. Ent. Res., IV, p. 89.

Glossina pallidipes Austen

Glossina pallidipes Austen, 1903, 'Monograph of the Tsetse-flies,' p. 87, Pl. IV (♀ ♂; Kilimanjaro, Tanganyika Territory). Hegh, 1929, 'Les Tsé-tsés,' I, pp. 266 and 392, Pl. VIII, and fig. 221*d* (♀ ♂, pupa).

BELGIAN CONGO. — Ishasa River, south of Lake Edward, biting topi, *Damaliscus korrigum jimela,* April 11, 1927 (R. P. Strong).

G. pallidipes is a species of the open savannas of Africa, occurring in park-like country as well as in plains mostly covered with grass or with a few small trees and scattered bushes. It is mainly East African, being known from the Belgian Congo (in the northeastern corner, whence I have seen it from Vankerckhovenville, Kasenyi on Lake Albert, and the plains south of Lake Edward; in Manyema; and in the Katanga), Uganda, Kenya Colony, Italian Somaliland (as far as 6° N.), Tanganyika Territory, Nyasaland, Southern Rhodesia, Portuguese East Africa, and Zululand. It is the species of *Glossina* which extends farthest south (28° 40′ S.).

Glossina fusca (Walker)

Stomoxys fuscus Walker, 1849, 'List Dipt. Brit. Mus.,' III, p. 682 (sex not given, but the type was a ♀; without locality).

Glossina fusca Newstead, 1910, Ann. Trop. Med. Paras., IV, pp. 370 and 373 (♂); 1911, Bull. Ent. Res., II, p. 15, figs. 3–4 (♂). Austen, 1911, 'Handbook of the Tsetse-flies,' p. 68, fig. 16, Pl. VIII (♀ ♂). Hegh, 1929, 'Les Tsé-tsés,' I, pp. 277 and 351, Pl. XI, fig. 221*E*, and fig. 224, *9* (♀ ♂ and pupa).

LIBERIA. — Banga, October 1926. Kolobanu, October 29, 1926. Reppo's Town, September 1926. Suahkoko, September 5, 1926. Bakratown, September 30, 1926. Paiata, October 1926.

BELGIAN CONGO. — Lesse, in the Semliki Forest, July 21, 1914.

Austen (1911) redescribed this species after a female from Boje, Liberia, a locality which I have not been able to locate on a map. The true *G. fusca* appears to be a strictly West African species of the rain forest and the wider forest galleries that extend from the forest belt into the neighboring savannas. It is known with certainty from French Guinea, Sierra Leone, Liberia, the Ivory Coast, the Gold Coast, Togo, Dahomey, Nigeria, Cameroon, French Congo, Belgian Congo, Angola, and Uganda. The published records from Kenya Colony and Tanganyika Territory were probably all based upon some of the closely allied species with which *G. fusca,* until recently, has been confused.

In Liberia, where the species is by no means rare, it occurs in the primary rain forest as well as in the second-growth woods and it will travel much farther away from the dense shade than *G. pallicera.* It is never abundant, but bites man rather frequently along the bush paths. All the specimens which I have observed were active during the daytime and I have no proof that the species is nocturnal in Liberia. At Suahkoko, for instance, a female was caught biting man in bright sunlight between 1 P.M. and 2 P.M.

J. Schwetz (1919, 'Recherches sur les Glossines,' pp. 137–138) lays great stress upon his discovery that *G. fusca* in Katanga has nocturnal habits. His observations, however, seem to have been made mostly with a peculiar race more recently described as *Glossina fusca* var. *congolensis* Newstead and Evans (1921, Ann. Trop. Med. Paras., XV, p. 99, figs. 3–6; ♀♂; regions of Katompe and Kisengwa, Katanga, Belgian Congo), and not with the typical *G. fusca.* This form "*congolensis*" differs somewhat from the type in the structure of the male genitalia.

Glossina nigrofusca Newstead

Glossina nigrofusca Newstead, 1910, Ann. Trop. Med. Paras., IV, p. 370 (♀♂; Kasongo, Belgian Congo; Sunyani, Atroni and Odumase, Ashanti); 1911, *loc. cit.*, V, p. 125. Hegh, 1929, 'Les Tsé-tsés,' I, pp. 283 and 357 (♀♂).

Glossina grossa Newstead, 1910, Ann. Trop. Med. Paras., IV, p. 373 (not of Bigot).

LIBERIA. — Lenga Town, one male, August 15, 1926. Memmeh Town, one female, August 29, 1926.

This species is known only from Sierra Leone, Liberia, the Ivory Coast, the Gold Coast, Southern Nigeria, and the Belgian Congo (Kasongo). It is readily distinguished from *G. fusca* by the characters given by Newstead and Austen, and, in the field, by the larger size. Its habits in Liberia are similar to those of *G. fusca.* It bites during the daytime.

Glossina medicorum Austen

Glossina medicorum Austen, 1911, 'Handbook of the Tsetse-flies,' p. 98, fig. 24 (♀♂; Sangwin River, Liberia). Hegh, 1929, 'Les Tsé-tsés,' I, pp. 296 and 327 (♀♂).

This little-known species, originally described from Liberia, was not found by the Harvard African Expedition. It differs from the other two large tsetse-flies of Liberia (*G. fusca* and *G. nigrofusca*) in the relatively shorter palpi, their length not or hardly exceeding the greatest transverse diameter of the head. It is also known from the Ivory Coast, Gold Coast, Dahomey, and Southern Nigeria.

ANOPLURA[1]

PEDICULIDAE

Pediculus humanus humanus Linnaeus

Pediculus humanus Linnaeus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 610 (no sex given; off man, without locality, but probably from Europe).

Pediculus humanus capitis de Geer, 1778, 'Mém. pour Servir à l'Histoire des Insectes,' VII, p. 67, Pl. I, fig. 6 (Europe).

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[1] The Anoplura here listed have been identified by Dr. H. E. Ewing, of the United States National Museum. Some other species have been studied by Prof. G. F. Ferris, who has reported upon them in a separate paper (see p. 1038).

Pediculus (*Pediculus*) *humanus humanus* Ewing, 1926, Proc. U. S. Nat. Mus., LXVIII, Art. 19, p. 22, figs. 1*A*, 2, 3*A* and 7; Pl. III, fig. 8 (♀♂).

Liberia. — Moylakwelli, October 28, 1926, off native Liberians of the Kpwesi tribe.

Belgian Congo. — Lulenga, March 3, 1927, head lice off natives (Wanyaruanda; native name, "inda," used for both body and head lice).

Pediculus humanus corporis de Geer

Pediculus humanus corporis de Geer, 1778, 'Mém. pour Servir à l'Histoire des Insectes,' VII, p. 67, Pl. I, fig. 7 (Europe).
Pediculus vestimenti Nitzsch, 1818, Germar's Mag. Entomol., III, p. 305 (without description).
Pediculus (*Pediculus*) *humanus corporis* Ewing, 1926, Proc. U. S. Nat. Mus., LXVIII, Art. 19, p. 18.

Liberia. — Gbanga, September 13, 1926, body lice off native Liberians of the Kpwesi tribe. Moylakwelli, October 28, 1926, body lice off native Liberians of the Kpwesi tribe.

Belgian Congo. — Lulenga, March 3, 1927, off natives (Wanyaruanda).

It is interesting to note that both head and body lice were found on the natives of the hinterland of Liberia, who have come but little in contact with Caucasians, perhaps less so than any other African tribes.

Two diametrically opposed views have been held with regard to the identity of the body and head lice of man. According to Nuttall,[1] typical *capitis* and *corporis* are the extremes in the variation of the one species, *Pediculus humanus*, and they are identical in all essential points of structure; they merely represent two unstable races of one species, to be distinguished partly from practical considerations.[2] Not only do they interbreed as was shown by Bacot and Sikora; but, what is more important, Keilin and Nuttall claim that a strain of typical *capitis* may be transformed experimentally after a few generations into typical *corporis*.[3] If this were actually the case, head and body lice would be no more than adaptive forms, such as are exhibited by the so-called amphibious plants (*Polygonum amphibium*, for instance).

The opposite view that body and head lice are genetically quite distinct, either as species or as subspecies, has also had many advocates, and at various times entomologists have believed that different races of mankind each harbored a different race of *Pediculus*. Fahrenholz[1] has gone to the extreme of recognizing as many as seven distinct subspecies, four of body lice and three of head lice; he even claims that the body louse of the Japanese is subspecifically distinct from that of the Chinese.

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[1] Nuttall, G. H. F. 1919. 'The systematic position, synonymy and iconography of *Pediculus humanus* and *Phthirus pubis*.' Parasitology, XI, pp. 329–346.

1920. 'On Fahrenholz's purported new species, subspecies and varieties of *Pediculus*.' Parasitology, XX, pp. 136–153.

[2] From Nuttall's remark in a footnote to his 1919 paper (p. 345), that "the two forms are insufficiently fixed to be regarded as varieties," it would seem that he uses the term "race" not to cover the usual concept of a geographical or biological race, or subspecies, but rather that of a "form" wholly due to environmental conditions and not hereditary.

[3] Bacot, A. 1917. 'A contribution to the bionomics of *Pediculus humanus* (*vestimenti*) and *Pediculus capitis*.' Parasitology, IX, pp. 228–258.

Keilin, D. and Nuttall, G. H. F. 1919. 'Hermaphroditism and other abnormalities in *Pediculus humanus*.' Parasitology, XI, pp. 278–328, Pls. XII–XVII.

H. Sikora also was at first inclined to believe that head lice when bred on the body could be changed into body lice (1917, Arch. f. Schiffs- u. Tropenhyg., XXI, pp. 275–284). She found, however, that this did not even happen after eleven generations (1919, Arch. f. Schiffs. u. Tropenhyg., XXIII, pp. 65–67) and she now believes that the many intermediate specimens are due to crossing.

A recent paper by Ewing appears to be somewhat of a compromise between the two extreme opinions.[2] This author concludes that the forms of head lice infesting man are apparently largely hybrid races, the pure strains of which were originally found on the white, black, red, and yellow races of man living in their original geographical ranges. The pure races of these head lice should be regarded as distinct varieties, for they differ in definite morphological characters. No evidence was procured that the different primary races of mankind each harbored a different variety of body louse as well. Ewing gives characters to separate the head-lice of Caucasians, Mongolians, and American Indians. He also uses the subspecific name, *nigritarum* Fabricius, for the body louse of the African negro, but gives no characters to distinguish it from the body louse of Caucasians.

HAEMATOPINIDAE

Polyplax spinulosa (Burmeister)

Pediculus spinulosus Burmeister, 1838, 'Genera Insectorum,' I, Rhynchota, Pediculina, No. 8 (no sex; off *Rattus decumanus*, without locality).

Polyplax spinulosa Enderlein 1904, Zoolog. Anzeiger, XXVIII, p. 142; 1905, *loc. cit.*, XXIX, p. 192, figs. 1–4 (♀ ♂, larva).

Haematopinus (*Polyplax*) *spinulosus* Neumann, 1910, Arch. de Parasitologie, XIII, p. 526, fig. 2 (♀).

Pediculus denticulatus Nitzsch, 1864, Zeitschr. Ges. Naturw., XXIII, p. 24 (no sex; off *Rattus decumanus*, Germany).

Liberia. — Gbanga, off gray house rat, *Rattus rattus alexandrinus* (Geoffroy), September 22, 1926.

This species is a common parasite of *Rattus norwegicus* (Erxleben) (*decumanus*), *R. rattus alexandrinus*, and *Apodemus sylvaticus* (Linnaeus).

Polyplax reclinata (Nitzsch)

Pediculus reclinatus Nitzsch, 1864, Zeitschr. Ges. Naturw., XXIII, p. 23 (no sex; off *Sorex araneus*, Germany).

Polyplax reclinata Enderlein, 1904, Zoolog. Anzeiger, XXVIII, p. 142.

Haematopinus (*Polyplax*) *spiniger reclinatus* Neumann, 1910, Arch. de Parasitologie, XIII, p. 524.

Belgian Congo. — Bumba, off a shrew, *Scutisorex congicus* Thomas, December 31, 1926.

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[1] Fahrenholz, H. 1916. 'Zur Nomenklatur einiger Anopluren-Arten.' Zoolog. Anzeiger, XLVII, pp. 269–272. (Also 1916, *loc. cit.*, XLVIII, pp. 87–93).

[2] Ewing, H. E. 1926. 'A revision of the American lice of the genus *Pediculus*, together with a consideration of the significance of their geographical and host distribution.' Proc. U. S. Nat. Mus., LXVIII, Art. 19, pp. 1–30, Pls. I–III.

HAEMATOMYZIDAE

Haematomyzus elephantis Piaget

Haematomyzus elephantis Piaget, 1869, Tijdschr. v. Entom., (2) IV, p. 254, Pl. XI, figs. 1–14 (♀♂; off an elephant in the Zoölogical Gardens at Rotterdam). Newman, 1873, The Entomologist, VI, p. 465, fig. Enderlein, 1904, Zoolog. Anzeiger, XXVIII, p. 136. Ferris, 1916, Proc. California Ac. Sci., (4) VI, 6, p. 185.

Haematomyzus proboscideus Piaget, 1880, 'Les Pédiculines,' p. 658, Pl. LIV, fig. 2 (substitute name for *H. elephantis*). Mjöberg, 1910, Ark. f. Zool., VI, No. 13, p. 181, fig. 93 (♀).

Haematopinus proboscideus Megnin, 1897, Bull. Mus. Hist. Nat. Paris, III, p. 169, figs. *A* and *B* (♀♂).

Haematomyzus longirostris Piaget, 1869, Tijdschr. v. Entom., (2) IV, p. 254 (alternative name for *H. elephantis*).

Haematomyzus paradoxus Lahille, (date?), 'El Piojo y la Elefantita,' p. 3, figs. 1–9 (♀; off an elephant in the Zoölogical Gardens at Buenos Aires).

Idolocoris elephantis F. Walker, 1871, Science-Gossip, VII, p. 132, fig. 67 (♀; described as a new species; off elephant in Ceylon). Richter, 1871, *loc. cit.*, VII, p. 211.

Phantasmocoris elephantis F. B. White, 1871, Science- Gossip, VII, p. 234 (substitute generic name for *Idolocoris* F. Walker, 1871, not of Douglas and Scott, 1865).

BELGIAN CONGO. — Api, off African elephant, *Loxodonta africana* (Blumenbach) (J. Rodhain).

This remarkable louse has also been found on the Asiatic elephant (*Elephas indicus* Linnaeus) in Ceylon and Sumatra. Fahrenholz (1910, Zoolog. Anzeiger, XXXV, p. 714) has proposed to distinguish the form occurring in Sumatra as var. *sumatranus*, differing only from the typical form (supposedly of the African elephant) in the dimensions. Piaget in his original description did not indicate whether his specimens came from an African or an Asiatic elephant.

MALLOPHAGA [1]

MENOPONIDAE

Myrsidea ovata (Piaget)

Menopon ovatum Piaget, 1880, 'Les Pédiculines,' p. 430, Pl. XXXIV, fig. 6 (♀♂; off *Corvus scapulatus*, of unknown locality).

Myrsidea ovata Harrison, 1916, Parasitology, IX, p. 59. Ferris, 1916, Canad. Entom., XLVIII, p. 308.

LIBERIA. — Kaka Town, off a crow, *Corvus albus* P. L. Müller, August 25, 1926.

This species has been identified by Dr. H. E. Ewing.

Actornithophilus affinis (Nitzsch)

Colpocephalum affine Nitzsch, 1874, in Giebel, 'Insecta Epizoa,' p. 276 (off *Totanus maculatus*). Harrison, 1916, Parasitology, IX, p. 46.

Actornithophilus affinis Ferris, 1916, Canad. Entom., XLVIII, p. 303.

LIBERIA. — Du River, Camp No. 3, off *Actitis hypoleucos* (Linnaeus), August 4, 1926.

This species has been identified by Dr. J. Waterston.

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[1] Additional species of Mallophaga, obtained by the Harvard Expedition, have been studied by Prof. G. F. Ferris, who reports upon them elsewhere in this volume (p. 1023).

Colpocephalum dissimile Piaget

Colpocephalum dissimile Piaget, 1880, 'Les Pédiculines,' p. 520, Pl. XLIII, fig. 4 (♀♂; off *Milvus aegyptius*, without locality). Harrison, 1916, Parasitology, IX, p. 48.

Liberia. — Kaka Town, off *Gypohierax angolensis* (Gmelin), August 24, 1926.

This species has been identified by Dr. J. Waterston.

Menopon impar Piaget

Menopon impar Piaget, 1885, 'Les Pédiculines,' Suppl., p. 94, Pl. X, fig. 4 (♀♂; off *Psittacus timneh*, without locality). Harrison, 1916, Parasitology, IX, p. 38.

Liberia. — Gbanga, off *Psittacus erithacus timneh* Fraser, September 1926.

This species has been identified by Dr. J. Waterston.

LAEMOBOTHRIIDAE

Laemobothrion titan Piaget

Laemobothrium titan Piaget, 1880, 'Les Pédiculines,' p. 578, Pl. XLIX, fig. 1 (♀; off *Milvus aetolius*, of unknown locality). Harrison, 1916, Parasitology, IX, p. 65.

Belgian Congo. — Kibati, off *Milvus migrans parasitus* (Daudin), March 26, 1927.

This species has been identified by Dr. H. E. Ewing.

PHILOPTERIDAE

Lipeurus caponis (Linnaeus)

Pediculus caponis Linnaeus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 614 (off domestic fowl, without locality).

Lipeurus caponis Harrison, 1916, Parasitology, IX, pp. 12 and 83.

Lipeurus variabilis Nitzsch, 1838, in Burmeister, 'Handbuch d. Entom.,' II, p. 434 [1818, in Germar's Mag. der Entom., III, p. 293; without description] (no sex; off domestic fowl, without locality).

Goniocotes burnettii Packard, 1870, Amer. Naturalist, IV, p. 94, fig. 26 (off domestic fowl, North America).

Liberia. — Reppo's Town, very common on domestic fowl, Aug. 31, 1926. The native Kpwesi name of this insect is "te."

This species has been identified by Dr. H. E. Ewing.

Degeeriella rava (Kellogg)

Nirmus furvus var. *ravus* Kellogg, 1899, Occ. Papers California Ac. Sci., VI, p. 14, Pl. II, fig. 1 (off *Actitis macularia*, Panama).

Degeeriella rava Harrison, 1916, Parasitology, IX, p. 122.

Liberia. — Du River, Camp No. 3, off *Actitis hypoleucos* (Linnaeus), August 4, 1926.

This species has been identified by Dr. J. Waterston.

SIPHONAPTERA

HECTOPSYLLIDAE

Dermatophilus penetrans (Linnaeus)

Pulex penetrans Linnaeus, 1758, 'Syst. Nat.," 10th Ed., I, p. 614 (America).

Dermatophilus penetrans Guérin-Méneville, 1838, 'Iconogr. Règne Animal,' Text, p. 14 (*Pulex penetrans*, Atlas, 1836, Pl. II, fig. 9). J. Bequaert, 1926, 'Medical Rept. Hamilton Rice 7th Exp. Amazon,' p. 246.

Liberia. — Monrovia, common in man.

Belgian Congo. — Lulenga, at an altitude of 1,850 m., in man. Nya Ngezi, common in the resthouse.

Tanganyika Territory. — Bagilo, Uluguru Mountains, in man (Arthur Loveridge).

R. Blanchard (1895, 'Traité de Zoologie Médicale, II, p. 490–491) mentions that a foot of domestic pig, brought from Liberia by J. Jullien, was honeycombed with the tumors of the jigger flea. The parasite was introduced into Liberia about the year 1880. In the Belgian Congo, this pest is almost universal and extremely troublesome in certain localities, but it does not appear to occur much above 1,800 m. Roubaud and Van Saceghem (1916, Bull. Soc. Path. Exot., Paris, IX, p. 766) have commented upon the abundance of *D. penetrans* in pigs at Zambi, Lower Congo.

D. penetrans was originally an American insect which has been introduced by man into the tropics of the Old World. Most authors follow R. Blanchard in stating that it was carried first to the west coast of Africa (at Ambriz in Angola) in 1872.[1] At present it occurs over the whole of tropical Africa, extending southward into Zululand and the coastal belt of Natal. It is also found in the Senegal, the Anglo-Egyptian Sudan and Eritrea; but I have been unable to find whether it extends much farther northward. It was first reported from Madagascar about 1899.

I have given (1926) my reasons for retaining the generic name *Dermatophilus* instead of replacing it by *Tunga*, as has been advocated by N. G. Rothschild (1921, Ectoparasites, I, 3, p. 129) and more recently by K. Jordan (1929, Proc. Ent. Soc. London, IV, 1, pp. 34–35). *Rhynchoprion* Oken (1815) cannot be used for the jigger flea, not only because Oken did not intend to use it for *Pulex irritans*, but also because it is preoccupied by *Rhynchoprion* Hermann, 1804, 'Mémoire Aptérologique,' p. 14 (see A. C. Oudemans, 1906, Entom. Berichten Nederl. Ent. Ver., II, p. 123).

ECHIDNOPHAGIDAE

Echidnophaga gallinacea (Westwood), the stick-tight or stick-fast flea of poultry, occurs in the Lower Belgian Congo, where it was found in the region of Kisantu by H. Vanderyst (1913, Rev. Zool. Afric., II, 2, pp. 167–170) and at Zambi (Roubaud and Van Saceghem, 1916, Bull. Soc. Path. Exot., Paris, IX, p. 766).

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[1] Blanchard, R. 1889. 'Quelques mots sur la chique.' Bull. Soc. Zool. France, XIV, pp. 95–99. 1910. La chique n'existait pas en Afrique occidentale au XVIII^e siècle.' Arch. de Parasitologie, XIV, pp. 164–165.

Hesse, P. 1899. 'Die Ausbreitung des Sandflohs in Afrika.' Geogr. Zeitschr., V, pp. 522–530.

PULICIDAE

A species of *Xenopsylla* was found at Paiata, Liberia, on *Rattus rattus alexandrinus* (Geoffroy), and at Luvungi, Belgian Congo, on *Mastomys coucha ugandae* (De Winton).

It is of interest that no human flea, *Pulex irritans* Linnaeus, was taken during the entire trip of the Harvard African Expedition. All fleas observed biting man were *Ctenocephalus canis* (Curtis), the common dog-flea. In the Amazon Valley I found the human flea likewise absent, while the cat-flea, *Ctenocephalus felis* (Bouché), was the species found there on dogs and biting man occasionally. According to Foley (1929, Bull. Soc. Hist. Nat. Afrique du Nord, XX, p. 52), while *Pulex irritans* is extremely common in Northern Africa proper, it is not found in the Sahara, south of the Atlas Range. Jordan and Rothschild (1908, Parasitology, I, p. 12) saw specimens of *P. irritans* from Egypt, Abyssinia, Somaliland, Cape Colony, Benguela, and the island of São Thomé; but they mention no West African or Congo localities. It must be kept in mind that travellers' statements as to the abundance of "fleas" in certain localities do not necessarily refer to *P. irritans*, since they may be caused either by *Ctenocephalus* or by newly hatched and male *Dermatophilus penetrans*. In South Africa, however, *P. irritans* is common in many localities (Waterston, 1914, Ann. South Afric. Mus., X, p. 273; and Bedford, 1927, 11th and 12th Repts. Dir. Vet. Res. South Africa, I, p. 772).

ARCHAEOPSYLLIDAE

Ctenocephalus canis (Curtis)

Pulex canis Curtis, 1826, 'Brit. Entomol.,' VII, No. 114, figs. A–E and fig. 8 (no sex; no locality, but probably from England).
Ctenocephalus canis J. Bequaert, 1926, Medical Rept. Hamilton Rice 7th Exp. Amazon,' p. 247.

LIBERIA. — Reppo's Town, off domestic dog, August 31, 1926. Banga, biting man, October 23, 1926. Totokwelli, biting man in the resthouse, October 30, 1926. The native name of the flea among the Kpwesi is "mbafi." Moala, November 2, 1926.

BELGIAN CONGO. — Lulenga, at an altitude of 1,850 m., off domestic dog, off a civet cat, *Civettictis civetta* (Schreber), and biting man. The Wanyaruanda name of the flea is "imbarakasa."

DOLICHOPSYLLIDAE

A species of *Ceratophyllus* was found on a squirrel, *Aethosciurus byatti* Kershaw, at Bagilo and Nyange, Uluguru Mountains, Tanganyika Territory (Arthur Loveridge).

HYSTRICHOPSYLLIDAE

Dinopsyllus lypusus Jordan and Rothschild

Dinopsyllus lypusus Jordan and Rothschild, 1913, Novitates Zoologicae, XX, p. 570, figs. 36 and 37 (♀♂; off several species of rodents from many localities in Kenya Colony and Uganda). Schwetz, Fornara, and Collart, 1929, Ann. Soc. Belge Méd. Trop., IX, p. 241.

Tanganyika Territory. — Nyange, Uluguru Mountains, off *Lemniscomys griselda rosalia* Thomas (Arthur Loveridge). Vituri, Uluguru Mountains, off *Crocidura martiensseni* Neumann (Arthur Loveridge).

This flea has been identified by Dr. H. E. Ewing and Dr. K. Jordan.

A species of *Ctenophthalmus* was found on *Lophuromys aquilus aquilus* True, at Nyingwa, Uluguru Mountains, Tanganyika Territory (Arthur Loveridge).

COLEOPTERA

CICINDELIDAE

Dr. W. Horn, Director of the Deutsches Entomologisches Museum, Berlin-Dahlem, has kindly identified the following tiger-beetles collected by the Harvard Expedition:

1. *Cicindela fastidiosa* var. *vicina* Dejean. — Lenga Town, Liberia, August 15, 1926. Gbanga, Liberia, September 1926. Moala, Liberia, October 31, 1926.
2. *Cicindela cincta* Olivier. — Barumbu, Belgian Congo, January 6, 1927.
3. *Cicindela strachani* Hope. — Moala, Liberia, November 2, 1926. Bomboma near Moala, October 31, 1926. This large species was met with in dense rain forest only. It is remarkable for its semi-arboreal habits. It is usually seen along forest paths, resting on the leaves of bushes, five to six feet above the ground. When disturbed, it flies off to another bush.
4. *Cicindela brevicollis* var. *discoidea* Dejean. — Monrovia, Liberia. Moala, Liberia, October 31, 1926.
5. *Cicindela octoguttata* Fabricius. — Lenga Town, Liberia. Nickabo, Liberia, August 12, 1926. Gbanga, Liberia, September 1926. Moala, Liberia, October 31, 1926. Banga, Liberia, October 1926.

ANEUROBRACON, A REMARKABLE NEW GENUS OF BRACONIDAE FROM LIBERIA

By Charles T. Brues

In the extensive collection of Hymenoptera collected by Prof. Bequaert in Liberia, there is a single specimen of a very strange braconid. I was at first uncertain as to the affinities of this insect, but a closer examination shows that it evidently belongs to the subfamily Agathidinae (or Braconinae of some recent writers) where it must form the type of a new genus.

The most striking peculiarities of this form consist in the almost complete loss of the venation of the wings, although these organs are of full size and evidently suffice for active flight, and in an extreme lengthening of the hind legs. These are so long that they measure fully twice the length of the body, due to an excessive elongation of all of the segments, including the coxae and trochanters.

Many other genera in this subfamily have the hind legs very long, but I have seen nothing approaching the remarkable form of this species. There is also in some other genera a tendency for the second cubital cell and certain other wing veins to become atrophied, but again, no genera have been described with such an almost complete loss of venation.

Following is a description of the genus and its type species.

Aneurobracon, new genus

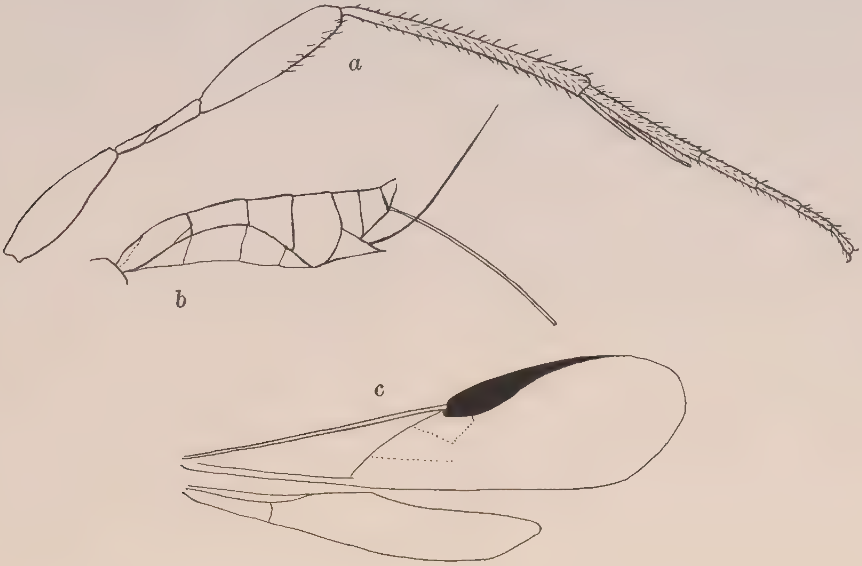
Body rather long and slender, the general proportions much as in *Macrocentrus*. Head transverse, the face convex and receding below; occiput without a marginal line, strongly concave; antennae slender, with 26 joints, inserted high up on the head, nearly twice as far from the margin of the clypeus as from the vertex; eyes large; ocelli in a triangle on the somewhat concave front; maxillary palpi five-jointed, stout, but with only the second joint slightly swollen. Mesonotum with the notauli weakly impressed anteriorly, merging into a large shallow median impression and not indicated behind; scutellum sub-triangular, separated by a curved groove at base. Propodeum long, its upper surface but little depressed behind when seen in profile; without areas or carinae above but with a complete lateral carina behind the small circular spiracle. Abdomen sessile, the first segment fully half as wide as the apex of the second segment, somewhat more than twice as long as wide at tip; second and third segments quadrate, without transverse grooves or impressions; following segments of softer consistency, the tip pointed; the whole abdomen about as long as the head and thorax together. Fore and middle legs rather slender, of the usual size; hind legs enormously lengthened, nearly twice as long as the entire body, the coxae, trochanters and tarsi especially lengthened. Ovipositor exserted, about as long as the abdomen. Wings long and narrow, with a large, lanceolate stigma, but almost without venation. Basal vein and nervulus weakly indicated and also the anal, although the submedian is entirely absent; radial vein present only as a very short first section, perpendicular to the stigma at the basal fourth of the latter. Hind wing with a single, narrow basal cell closed by a very delicate, but distinct vein.

Type: *A. bequaerti* sp. nov.

Aneurobracon bequaerti, new species

Text Fig. No. 9

Length 2.5 mm.; hind leg 5.0 mm. Black, the second segment of the abdomen and the bases of the following segments reddish brown; fore and middle legs brownish; wings hyaline, the stigma piceous, the few veins that are present, very pale testaceous. Face shining, faintly shagreened; clypeal foveae distinct, cheeks and malar space short; front very short, as the ocelli are in a large equilateral triangle only a short distance above the antennae. Antennal scape subcylindrical, about twice as long as thick, received in a distinct depression between the eye and the ocelli; pedicel a little more than half as long as the scape and much thicker than the flagellum; first flagellar joint three times as long as thick, the following joints very gradually shorter and more slender, the penultimate half as long as the first. Mesonotum shagreened, subopaque, clothed with sparse glistening hairs in and behind the discal impression. Propodeum above densely and very minutely punctate, almost shagreened. Pleura shagreened, the mesopleura with a broad, shallow furrow. Abdomen shining above, the first segment shagreened, the others smooth. Ovipositor white, very finely pointed at tip, its sheaths conspicuously hairy. Hind coxae elongate oval, narrowed apically, as long as the propodeum and scutellum together; trochanter thin, cylindrical, two-thirds as long as the coxa; tibia and tarsus clothed with bristly hairs, the longer spur of the tibia nearly as long as the first tarsal joint which is half as long as the tibia. Wings rather strongly hairy.



Text Figure 9. — *Aneurobracon bequaerti*, new species. *a*, hind leg; *b*, abdomen in profile; *c*, wings. All parts drawn at the same magnification

Type, female, from Firestone Camp No. 2, on the right bank of the Du River, Liberia, August 3, 1926 (*J. Bequaert*).

THE CRANE-FLIES

(Family Tipulidae, Order Diptera)

By Charles P. Alexander, Amherst, Massachusetts[1]

The crane-flies that were taken on the expedition of the Harvard Medical School to tropical Africa in 1926–1927 have been sent to me for determination by the collector of the material, Dr. Joseph Bequaert, to whom I extend my deepest thanks. Several of the species proved to be new to science, while still others added materially to our rather scanty knowledge of distribution of the Tipulidae of the Ethiopian Region. The most interesting series were those taken in Liberia, especially at Firestone Plantation No. 3, on the right bank of the Du River, ten miles east of Monrovia, and the small but highly interesting series from the volcanic cones of Mikeno and Karisimbi, in the eastern Belgian Congo. Through the kind interest of Dr. Bequaert, the types of the novelties are preserved in my collection.

TIPULINAE

Tipula speiseriana, new species

Belongs to the *oleracea* group; general coloration yellow and dark brown; antennae approximately as long as the combined head and thorax, the outer segments dark brown; wings broad, the whitish subhyaline area in the radial field reaching the wing-margin in cell R_5; vein R_3 long; male hypopygium yellow.

Male. — Length about 17–18 mm.; wing 19–20 mm.; antennae about 6 mm.

Described from alcoholic specimens.

Frontal prolongation of head brownish yellow; nasus elongate; palpi dark brown, the apices of the individual segments somewhat paler. Antennae of moderate length, in the male approximately as long as the combined head and thorax; scape obscure yellow; basal flagellar segments brownish yellow, the outer segments bicolorous, the basal enlargement being darker brown than the remainder of each segment; outer segments uniformly dark brown; longest verticils subequal to the segments; terminal segment very reduced. Head grayish, the front and narrow posterior orbits paler.

Mesonotal praescutum obscure brownish yellow, the disk almost covered by three dark brown stripes, the median stripe entire; scutal lobes extensively dark brown; a dark median triangle behind the suture; scutellum dark, with a capillary darker brown median vitta; parascutella pale; postnotal mediotergite grayish brown with a median dark brown vitta, the lateral margins pale. Pleura chiefly yellow, the ventral sternopleurite and meron infuscated. Halteres elongate, dark brown. Legs with the coxae chiefly yellow, the outer face of the middle coxae infuscated; femora and tibiae brownish yellow, their tips darkened; basitarsi yellowish brown, the tips darker; remainder of tarsi black; legs long and slender; claws small, simple. Wings broad, tinged with brown, variegated with darker brown and whitish subhyaline longitudinal stripes; the white areas include an extensive stripe in the radial field, including most of the outer portions of cells R and M and all of cell R_5 to the margin; bases of cells Cu and *1st A* similarly whitened; costal margin yellowish brown; stigma and a broad seam in cell M along Cu, and on *m-cu*, darker brown. Venation: R_3 unusually elongate, nearly straight, approximately four times R_{1+2}; cell *2nd A* broad.

Abdominal tergites yellowish brown, with three brownish black stripes; sternites yellowish brown, the median line darker, the outer segments more uniformly darkened; hypopygium bright yellow. Male hypopygium with the tergite bearing the usual two truncated lobes, these densely set with microscopic black spinulae. Outer dististyle broad, the apex obliquely truncated to feebly concave. Inner dististyle with the lower apical angle produced into a slender curved rod, the tip blackened and acute.

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[1] Contribution from the Entomological Laboratory, Massachusetts Agricultural College.

Hab. BELGIAN CONGO (Kivu).

Holotype, alcoholic ♂, Kabara Camp, on southwest slope of Mt. Mikeno, altitude 10,500 feet, in subalpine zone (*Hagenia* formation), March 16, 1927 (*J. Bequaert*). *Paratopotypes*, 4 ♂♂.

Tipula speiseriana is named in honor of Dr. P. Speiser, distinguished student of the Diptera of Africa. The species seems intermediate in its characters between *T. soror* Wiedemann and *T. frater* Alexander, with short yellow antennae, and *T. eumecacera* Speiser and *T. capnioneura* Speiser, in which the antennae in the male sex extend to beyond the base of the fifth abdominal segment. It is very possible that the present species will be found to have subapterous females as is the case with several species of *Tipula* from the high mountains of equatorial Africa.

Tipula (Acutipula), species

Females of two distinct species, from Moala, thirty miles from the coast, north of Monrovia, Liberia, and from Paiata, on the St. Paul's River, eighty-five miles from the coast, northeast of Monrovia, Liberia, October 10, 1926 (*J. Bequaert*).

Nephrotoma ruwenzoriana Alexander

1920. *Nephrotoma ruwenzoriana* Alexander; Bull. Amer. Mus. Nat. Hist., 43: 20, pl. 4, fig. 6.
1923. *Nephrotoma ruwenzoriana* Alexander; Rev. Zool. Africaine, 11:14–16.

The type, a female, was from Mt. Ruwenzori, collected at 3,000 meters, April 15, 1914, by Dr. Bequaert. Numerous additional specimens were later recorded from Uganda and Kenya Colony, at altitudes of between 3,500 and 8,000 feet. In the present collection, a male, from Kabale, Uganda, was taken in the cultivated lower mountain zone, at 6,500 feet, by Dr. Bequaert. This specimen agrees well with the type except that the bases of abdominal segments two to four are orange-yellow. The prothorax and mesothorax are blue-black, entirely without pale colors other than a vague reddish suffusion on the postnotal mediotergite.

Nephrotoma chalybea Alexander, variety

1921. *Nephrotoma chalybea* Alexander; Ann. Mag. Nat. Hist., (9) 7 : 101–103.

A male from Kisenyi, on the northern shore of Lake Kivu, 1° 35′ S., 29° 15′ E., in lower mountain forest at 4,400 feet. This agrees well with the type except that the blue-black coloration of the thorax and abdomen is unusually developed.

Nephrotoma fuscipennis triflava Alexander

1921. *Nephrotoma fuscipennis triflava* Alexander; Ann. Mag. Nat. Hist., (9) 7 : 107.

A male from Kisenyi, north shore of Lake Kivu, February 10, 1927 (*J. Bequaert*).

Nephrotoma tumidiverticalis, new species

General coloration yellow, variegated with black; posterior region of vertex and the occiput extensively blackened; praescutum and scutum chiefly blackened, the scutellum and postnotal mediotergite orange-yellow; pleura blackened, variegated with yellow, especially on the posterior sclerites; legs with the femora yellow, the tips broadly blackened, most extensively so on the fore femora; wings brownish yellow, the stigma pale brown; abdominal tergites yellow, trivittate with black, the caudal margins of the segments further margined with black, restricting the ground-color to sublateral areas, these becoming smaller to finally obliterated on the outer segments.

Male.— Length about 13 mm.; wing 12–13 mm.

Described from alcoholic specimens.

Frontal prolongation of head high, bright yellow, restrictedly infuscated dorso-medially; nasus brownish black; palpi light brown, the terminal segment paler. Antennae (♂) relatively long, if bent backward extending to about opposite midlength of the second abdominal segment; scapal segments yellow, the first darker above; flagellum entirely black, the basal segments moderately incised. Head with the vertical tubercle unusually inflated, slightly compressed, the cephalic margin weakly bifid, bright yellow; posterior region of head dark brown, sending cephalad three prolongations, one along the inner margin of each eye, in addition to a narrow capillary median vitta; postgenae yellow.

Pronotum black, obscure yellow medially. Mesonotal praescutum almost covered by three broad black stripes, the humeral region appearing as restricted yellow triangles; scutal lobes and parascutella black, the median region of the scutum pale; scutellum obscure yellow, with a brownish median area on posterior margin; postnotal mediotergite chiefly orange-yellow, slightly darkened laterally. Pleura almost entirely blackened, the dorso-pleural region pale; vague yellowish areas on the posterior portions of the anepisternum, pteropleurite, and dorsal portion of meron; pleurotergite variegated by a large yellow area. Halteres dusky, the tips of the knobs paler. Legs with the coxae black; trochanters abruptly yellow; femora yellow basally, the tips blackened, this very broad on the fore legs where only the basal fourth is yellow; on middle and hind femora the black tips are subequal and include approximately the distal sixth; tibiae dark brown, the tips narrowly blackened; tarsi black. Wings with a brownish yellow ground-color, the costal margin and cell Cu_1 more saturated; stigma oval, pale brown; basal half of stigma with about a dozen macrotrichia; vague brown seams on anterior cord; veins darker. Venation: Sc_1 preserved except at extreme tip; Rs gently arcuate, about one-third longer than the basal section of R_{4+5}; cell M_1 sessile.

Abdomen with tergite one black, narrowly margined caudally with yellow; remaining tergites yellow, heavily trivittate with black, the caudal margins of the segments likewise blackened, restricting the yellow to sublateral areas that decrease in amount on the outer segments, on the sixth and seventh tergites being greatly reduced; eighth tergite black with a circular orange mark at base on either side of the median line; ninth tergite black, the caudal margin paler medially; sternites with the caudal margins of the individual segments extensively blackened, the amount increasing on the outer segments; hypopygium dark, the styli yellow. Male hypopygium with the tergite transverse, the caudal margin with a broad U-shaped emargination which is occupied by a flattened yellowish shelf, this further divided by a linear median notch. Eighth sternite with a weak median emargination.

Hab. BELGIAN CONGO (Kivu).

Holotype, alcoholic ♂, Rueru Camp, on southwest slope of Mt. Mikeno, altitude 9,150 feet, in bamboo region, March 15, 1927 (*J. Bequaert*). *Paratopotypes*, 2 ♂♂.

I cannot identify this handsome *Nephrotoma* with any of the numerous Ethiopian species so far described.

Nephrotoma, species

The following specimens, all females, are present: Bumba, Belgian Congo, 2° 10′ N., 22° 30′ E., December 31, 1926; Lulenga, Belgian Congo, 1° 20′ S., 29° 20′ E., altitude 5,500 feet, in lower mountain forest, February 17, 1927; Behungi, Uganda, altitude 8,300 feet, in bamboo formation; Kisolo, Uganda, 1° 15′ N., 29° 40′ E.

LIMONIINAE

LIMONIINI

Limonia (Limonia) vilhelmi Alexander

1924. *Limonia vilhelmi* Alexander; Arkiv för Zoologi, 16, no. 18: 2–3.

The unique type, a female, was from Birunga, Mt. Mikeno, altitude 3,100 meters, March 21, 1921, collected by Gyldenstolpe. A male specimen in the present series is from near the type-locality, Rueru Camp, on the southwest slope of Mt. Mikeno, altitude 9,150 feet, in bamboo region, March 15, 1927 (*J. Bequaert*).

A question of synonymy in the naming of these large mountain species of *Limonia* has arisen. In my opinion, Dr. Speiser, when describing *L. rhanthisa* (Wien. Ent. Zeitung, 40: 87–88; 1923) has inadvertently created a synonym of his *L. rhizosema* (Sjöstedt's Kilimandjaro-Meru Exped., Diptera, Orthorapha Nematocera: 48–49, figs. 6–7; 1909). The original description of the latter calls only for a species with the tips of the femora blackened, no mention being made of any specimens in the type-series having a narrower subterminal dark ring. Later, in a letter to Edwards (Trans. Linn. Soc. London, Zool., (2) 15: 201; 1912), Speiser mentioned one specimen in this series as having a subterminal ring, the remainder of the series having this terminal in position. When describing *rhanthisa*, Speiser restricted the name to the species with an apical dark ring rather than applying it to the form not defined in the original diagnosis of *rhizosema*. The lectotype specimen of *rhizosema* in the Riksmuseum in Stockholm has the dark femoral tips, making *rhanthisa* a strict synonym. The material in the type-series of this species (from Kilimanjaro, May to August, 1905, collected by Sjöstedt) with a subterminal dark femoral ring may pertain to **Limonia subapicalis,** new name (for *L. capensis* Alexander, Ann. So. Afr. Mus., 17: 143–145, pl. 10, fig. 6; 1917, described in *Libnotes;* preoccupied by *L. capensis* Macquart, 1838), to *L. vilhelmi* Alexander, as discussed above, or may represent still another of these showy mountain forms of *Limonia.*

Limonia (Limonia) firestonei, new species

Text Fig. No. 10, *1* and *11*

General coloration dark brown; antennae moniliform; wings with a brown tinge, the stigma not apparent; male hypopygium with the median lobe of the tergite produced into a finger-like lobe; apex of mesal appendage of basistyle and of the dististyle each narrowed to a spinous point.

Male. — Length about 5 mm.; wing 5.2 mm.

Described from an alcoholic specimen.

Rostrum and palpi dark brown. Antennae dark brown throughout; flagellar segments subglobular with short, glabrous necks, the terminal segment more elongate. Head dark brown.

Mesonotum dark brown, the disk of the praescutum and the scutal lobes darkest, the humeral region of the praescutum, lateral ends of the suture and the postnotum laterally more yellowish brown. Pleura extensively brownish yellow. Halteres infuscated. Legs with the coxae and trochanters brownish yellow; remainder of legs black; posterior legs broken, but presumably with the tarsi chiefly snowy-white as in the allied *L. metatarsalba* Alexander (Cameroon). Wings (Fig. 10, *1*) with a brownish tinge, the prearcular and costal regions still darker; no evident stigma; veins dark brown. Venation: Sc_1 ending about opposite three-fourths *Rs*, Sc_2 close to its tip; free tip of Sc_2 and R_2 in transverse alignment; *m-cu* at the fork of *M*.

Abdomen, including the hypopygium, chiefly dark brown, the incisures and pleural membrane even darker. Male hypopygium (Fig. 10, *11*) with the median region of the tergite produced caudad and dorsad into a conspicuous finger-like median lobe. Basistyles relatively stout, the ventromesal lobe slender, narrowed to an acute, curved, chitinized point. A single dististyle, elongate-oval, narrowed to an acute chitinized point; at near midlength with a single flattened plate that presumably represents the usual rostral prolongation, this with the outer cephalic angle produced into a spine; on face of style, opposite this prolongation, a small low tubercle that is set with two very long setae. Eighth sternite medially at caudal end with a dense brush of black setae.

Hab. LIBERIA.

Holotype, alcoholic ♂, Firestone Plantation No. 3, on right bank of Du River, ten miles east of Monrovia, July 27, 1926 (*J. Bequaert*).

L. (*L.*) *firestonei* is closest to *L. metatarsalba* Alexander, differing in the longer *Sc*, more transverse alignment of R_2 and free tip of Sc_2 and the shorter cell *1st* M_2. Unfortunately the male of *metatarsalba* is still unknown.

Limonia (Limonia) bequaerti, new species

Text Fig. No. 10, *2*

General coloration dark brown; mouthparts and palpi reduced; antennae black, the basal flagellar segments subglobular with short apical necks; legs dark brown, the distal half of tibiae and most of tarsi white; wings with a strong brown suffusion; abundant macrotrichia in all cells of wing except those of about the basal fifth.

Female. — Length about 8.5 mm.; wing 7.4 mm.

Described from an alcoholic specimen.

Rostrum very reduced to lacking, pale, the palpi apparently 2-segmented, erect to porrect, the terminal segment darkened. Antennae black, the terminal segments broken; flagellar segments subglobular, with short glabrous apical necks, the longest verticils unilaterally arranged. Head relatively broad, dark brown, the anterior vertex about one-half wider than the diameter of the first scapal segment.

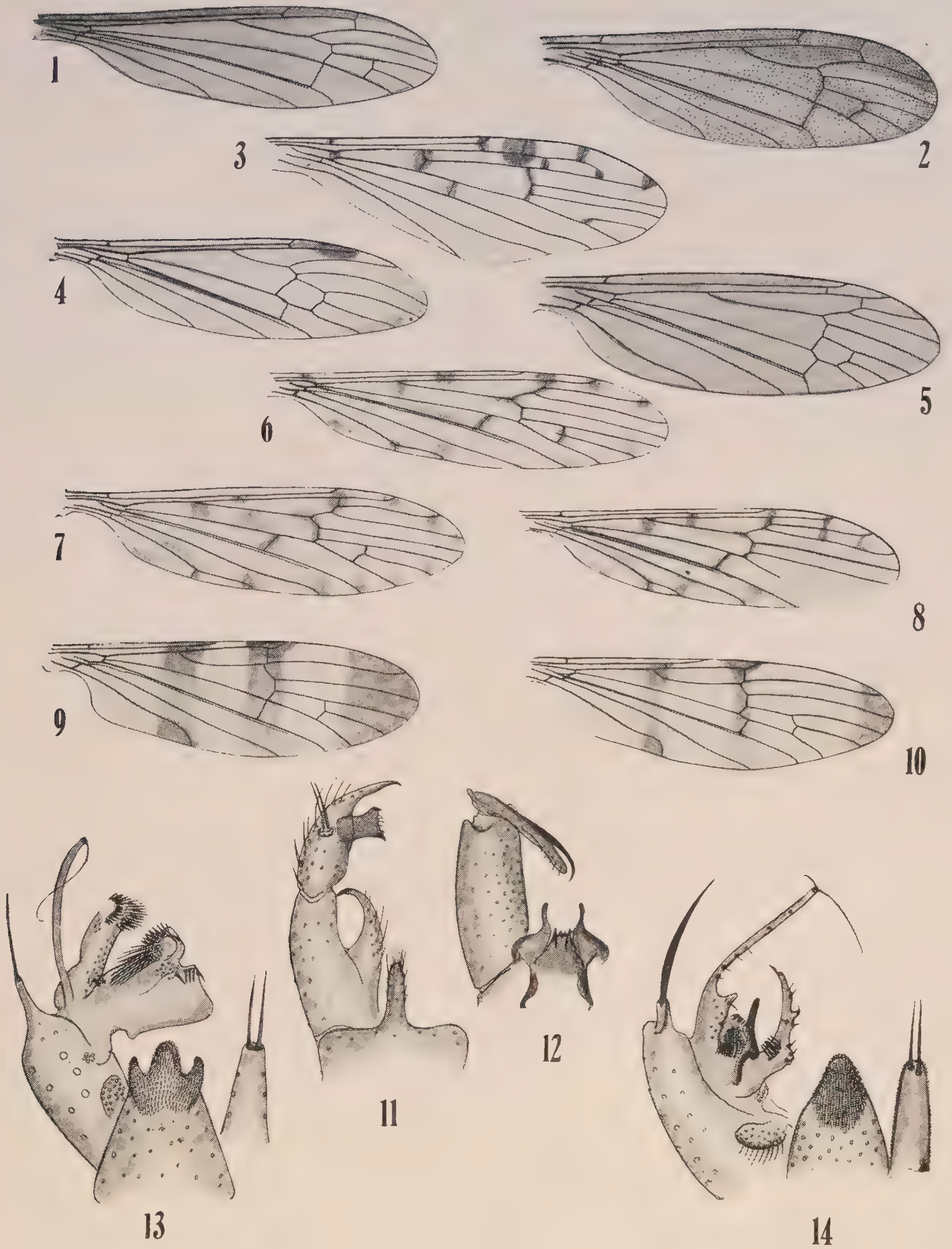
Pronotum and mesonotum dark brown, without evident markings (in alcohol). Pleura still darker brown, especially on the posterior sclerites. Halteres entirely infuscated. Legs with the coxae brown; trochanters brownish black; all legs are detached in vial with several other species but the association with the present form is evidently correct; femora dark brown, slightly paler basally; tibiae dark brown on proximal half, the distal half and the tarsi dirty white, only the terminal two tarsal segments darkened; claws long and slender, simple except for a basal setiferous tubercle. Wings (Fig. 10, *2*) with a strong brown suffusion, with a vague darker brown pattern, including cell *C* and seams on the cord, outer end of cell *1st* M_2, R_{1+2} and R_2, and the distal ends of cells R_2 and cephalic portion of R_3; veins dark brown. Conspicuous macrotrichia in all cells of wing except those of the basal fifth or sixth. Venation: Sc_1 ending opposite three-fourths Rs, Sc_2 at its tip; *Rs* long, arcuated; R_2 and free tip of Sc_2 in approximate alignment; basal section of R_{4+5} a little longer than *r-m; m-cu* close to fork of *M*, subequal to distal section of Cu_1.

Abdomen dark brown. Ovipositor with the tergal valves small and slender, upcurved; sternal valves stout and straight.

Hab. LIBERIA.

Holotype, ♀, Firestone Plantation No. 3, on the right bank of Du River, ten miles east of Monrovia, July 27, 1926 (*J. Bequaert*).

This interesting *Limonia* is named in honor of the collector, Dr. Joseph Bequaert. The only allied regional species is *L.* (*L.*) *holotricha* Alexander



Text Figure 10. — (1) *Limonia* (*Limonia*) *firestonei*, sp. n.; wing. (2) *Limonia* (*Limonia*) *bequaerti*, sp. n.; wing. (3) *Protorimarga bequaertiana*, gen. et sp. n.; wing. (4) *Helius cacoxena* (Alexander); wing. (5) *Eriocera monroviae*, sp. n.; wing. (6) *Podoneura bequaertiana*, sp. n.; wing. (7) *Podoneura anthracogramma* Bergroth; wing. (8) *Podoneura brevifurcata* Alexander; wing. (9) *Teucholabis nodipes praescutellaris*, subsp. n.; wing. (10) *Teucholabis rubrithorax* Alexander; wing. (11) *Limonia* (*Limonia*) *firestonei*, sp. n.; male hypopygium. (12) *Protorimarga bequaertiana*, gen. et sp. n.; male hypopygium. (13) *Styringomyia liberiensis*, sp. n.; male hypopygium. (14) *Styringomyia dendroides*, sp. n.; male hypopygium.

(Cameroon) which has the same peculiar mouthparts and leg-coloration, differing in the large size and details of coloration and venation, especially the angulate Rs, reduced basal section of R_{4+5} and other characters.

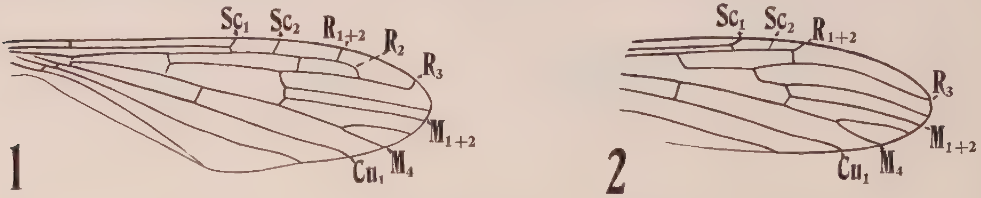
Limonia (Rhipidia) miosema Speiser

1909. *Limonia miosema* Speiser; Sjöstedt's Kilimandjaro-Meru Exped., Diptera, Orthorapha Nematocera, 50–51.

The types were from moderate altitudes (1,300–1,900 meters) on Kilimanjaro, collected in September 1905 by Sjöstedt. In the present material, a pair from Lulenga, Belgian Congo, 1° 20′ S., 29° 20′ E., altitude 5,500 feet, in lower mountain forest, March 29, 1927 (*J. Bequaert*). The rostral prolongation of the male hypopygium bears four spines, in this respect differing from the allied *L.* (*R.*) *pallidipes* (Alexander).

Protorimarga, new genus

General form of body elongate and attenuated as in *Orimarga* and *Diotrepha,* the meral region being greatly reduced, the sternopleurite and prothoracic region correspondingly lengthened. Rostrum short; maxillary palpi short, 4-segmented, the basal segment longest. Antennae 16-segmented; first segment elongate, the flagellar segments passing through globular to long-oval. Legs long and slender, the segments with scattered semi-erect setae; claws elongate, in male with an acute subappressed tooth on outer face at near midlength. Wings (Fig. 11, *1*, and Fig. 10, *3*) broad, especially in the much developed anal field, widest just beyond the ending of vein *2nd A;* costal margin of wing opposite the stigmal region considerably dilated, widening the cells in this region, this very possibly a sexual character. Venation: Sc long, Sc_1 ending beyond midlength of the long Rs, Sc_2 at its tip; free tip of Sc_2 long and conspicuous; Rs long; R_2 strongly arcuated and recurved, R_{1+2} being perpendicular; a supernumerary crossvein in cell R_1 between the free tip of Sc_2 and R_{1+2} and shortly beyond the level of *r-m;* tip of R_3 bent strongly cephalad at about a right angle; a long spur or crossvein at the bend of the angulated Rs, connecting posteriorly with vein M or nearly so; medial field as in *Orimarga; m-cu* about opposite one-third the length of Rs; both anal veins very long, gently divergent. Male hypopygium (Fig. 10, *12*) with the basistyles elongate. Dististyles long, fused except at tips, the outer style terminating in a slender curved point, the inner style nearly as long, fleshy, setigerous. Gonapophyses appearing as heavily chitinized plates that are produced into short rods that are directed caudad. Aedeagus very short.



Text Figure 11. — Venational symbols: Cu = Cubitus; M = Media; R = Radius; Sc = Subcosta

(1) Venation of *Protorimarga bequaertiana,* gen. et sp. n.
(2) Venation of *Orimarga,* sp.

Genotype. — *Protorimarga bequaertiana,* sp. n. (Ethiopian Region).

The remarkable fly that is here made the type of a new genus of the subtribe Orimargaria presents some puzzling venational features. I believe the radial field has been correctly interpreted, as above, but there may be some dispute concerning this. The alternative explanation would call the free tip of Sc_2, as above, a supernumerary crossvein, with the remainder of the venation about as interpreted. The three genera of the Orimargaria now known may be separated as follows:

1. A supernumerary crossvein in cell R_1 between the origin of *Rs* and R_2; anal region of wing greatly expanded, the veins long.
Protorimarga, gen. n.
No supernumerary crossvein in cell R_1; anal region of wing narrowed, the veins, especially *2nd A*, correspondingly reduced.. 2.
2. Cell M_3 of wing present; *m-cu* underneath *Rs*.
Orimarga Osten Sacken.
Cell M_3 of wing lacking; *m-cu* some distance before origin of *Rs*.
Diotrepha Osten Sacken.

Protorimarga, as known, is solely Ethiopian. *Orimarga* has been found in all the major regions of the world. *Diotrepha* is Neotropical, invading the southern portions of the Nearctic Region.

Protorimarga bequaertiana, new species

Text Figs. Nos. 10, *3* and *12*, and 11, *1*

General coloration dark brown, the head and mesonotum more pruinose; first antennal segment brownish black, the remainder obscure yellow; knobs of halteres dark brown; femora chiefly dark brown, with a narrow subterminal white ring; wings whitish, with a heavy, chiefly costal dark brown pattern.

Male. — Length about 6.5 mm.; wing 3.6 mm.

Described from an alcoholic specimen.

Rostrum and palpi brownish black. Antennae with the basal segment brownish black, the remainder of the organ obscure yellow, the outer segments somewhat darker; outer flagellar segments more elongated; verticils of segments relatively inconspicuous. Head dark gray; anterior vertex relatively narrow, about one-half wider than the diameter of the first scapal segment.

Pronotum brown. Mesonotum chiefly bluish gray, the humeral region of the praescutum more obscure yellow, the lateral margins behind the pseudosutural foveae darker brown. Pleura chiefly dark brown, the dorso-pleural region paler; a very narrow pale longitudinal vitta crosses the sternopleurite, the sclerite ventrad of this darker brown. Halteres white, the knobs dark brown. Legs with the fore coxae and trochanters pale brown, the remaining coxae and trochanters brownish black; femora obscure yellow basally, passing into dark brown, before the tips with a narrow white ring, the dark tips approximately three times as wide as the subterminal annulus; tibiae dusky, the extreme base narrowly white, the tips more broadly blackened; tarsi chiefly brownish white. Wings (Fig. 10, *3*) whitish, with a distinct, chiefly costal, dark brown pattern, including about ten areas, the largest surrounding the free tip of Sc_2, confluent with a narrower seam along the cord; the other spots surround *h* and the arculus; origin of *Rs* and its spur; tip of *Sc;* the supernumerary crossvein in cell R_1; R_{1+2}; perpendicular base of R_2; perpendicular tip of R_3; *m-cu* and a small spot at the fork of M_{3+4}; veins whitish, very indistinct, darker in the infuscated areas. Wings considerably dilated in the costal region, opposite the cord, this possibly a character of the male sex; anal region considerably dilated, especially the outer end of cell *1st A;* cell *2nd A* elongate, the outer end pointed. Venation as discussed under the generic diagnosis.

Abdomen chiefly dark brown, the lateral margins of the sclerites narrowly pale; hypopygium brownish black. Male hypopygium (Fig. 10, *12*) with the basistyles relatively elongate, the mesal face unarmed except for somewhat more numerous setae. Other characters of the hypopygium as defined under the genus.

Hab. LIBERIA.

Holotype, alcoholic ♂, Firestone Plantation No. 3, on right bank of Du River, ten miles east of Monrovia, July 26, 1926 (*J. Bequaert*).

This unusually interesting crane-fly is named in honor of the collector, Dr. Joseph Bequaert, distinguished authority on the fauna and geography of tropical Africa.

Helius cacoxena (Alexander)

1920. *Rhamphidia cacoxena* Alexander; Ann. Mag. Nat. Hist., (9) 6 : 22.

The unique type, a female, was from Ilesha, southern Nigeria, taken August 17, 1910, by Captain L. E. H. Humfrey. In the present series, a second female, from the Firestone Plantation No. 3, Du River, Liberia, July 27, 1926, collected by Dr. Bequaert. The wing is shown in Fig. 10, *4*.

HEXATOMINI

Eriocera monroviae, new species

Text Fig. No. 10, *5*

Male. — Length about 13–15 mm.; wing 13–15 mm.

Female. — Length about 14 mm.; wing 12 mm.

Described from alcoholic specimens.

Characters as in *E. leonensis* Alexander, differing chiefly in the details of coloration, especially of the thoracic pleura and abdomen.

Mouthparts very reduced. Antennae short in both sexes; scape yellow; flagellum dark. Head orange.

Mesonotum with the praescutum and anterior scutal lobes virtually covered by black stripes, on the former restricting the pale color to the restricted humeral region and posterior interspaces; posterior portion of scutal lobes, median area of scutum, the scutellum and postnotum yellow. Pleura chiefly obscure yellow, only the dorsal region and anepisternum darkened; cephalic margin of the sternopleurite and the cephalic face of the coxae lined with brown. Legs with the coxae chiefly yellow, especially the fore coxae; trochanters obscure yellow; remainder of legs black, the femoral bases narrowly obscure yellow, more broadly so on the femora. Wings (Fig. 10, *5*) with a strong brown suffusion, the base and costal cell more suffused; veins darker. Venation: Rs unusually long; R_2 shorter than R_{2+3}; R_{1+2} exceeding R_{2+3+4}; cell M_1 lacking; *m-cu* about one-third its length beyond the fork of M.

Abdomen chiefly yellow, including the basal segments and the hypopygium, the subterminal segments, especially of the sternites, blackened.

The female is similar to the male but has the legs shorter, the fore femora with a vague subterminal pale annulus.

Hab. LIBERIA.

Holotype, alcoholic ♂, Banga, in deep woods, October 24, 1926 (*J. Bequaert*). *Allotype,* ♀, Firestone Plantation No. 3, right bank of Du River, August 2, 1926 (*J. Bequaert*). *Paratopotypes,* 2 ♂♂; *paratype,* ♂, in copula with the female.

The West African species of *Eriocera*, *leonensis* Alexander, *commutabilis* Alexander, *flavocincta* Alexander, and *monroviae*, sp. n., are obviously closely allied and are separated chiefly on details of coloration. The following key to the Ethiopian species of *Eriocera* shows this relationship.

1. Cell M_1 of the wings present.
   (Madagascar) *obscura* (Bigot).
   Cell M_1 of the wings lacking .... 2.
2. R_{2+3+4} subequal to or shorter than R_{3+4}, R_2 far basad of the fork of R_4.
   (Seychelles) *luteipennis* Edwards.
   R_{2+3+4} much longer than R_{3+4}, the latter in most cases lacking, R_4 forking basad of R_2 .... 3.

3. Macrotrichia in apical cells of wings.
(Seychelles) *obscuripennis* Edwards.
No macrotrichia in cells of wings. . . . . 4.
4. Cell M_2 confluent with M_3, there being no discal and only three posterior cells.
(Seychelles) *ferruginea* (Edwards).
Cell *1st* M_2 and *2nd* M_2 distinct from M_3. . . . . 5.
5. Wings brown, with three white marginal spots in the radial field.
(Mozambique) *albonotata* (Loew).
Wings not patterned as above. . . . . 6.
6. Femora brown, with a broad yellow ring before the tips, this exceeding in area the dark tips.
(Ivory Coast) *flavocincta* Alexander.
Femora uniform in color or with a narrow vague pale ring on the fore legs, in the latter cases (*monroviae*, *evanescens*) this band much narrower than the darkened apex. . . . . 7.
7. R_2 beyond the fork of R_{3+4} on R_3, subequal to R_{2+3}. . . . . 8.
R_2 before, at or close to the fork of R_{3+4}. . . . . 12.
8. Wings with a strong dark brown to blackish tinge, without distinct markings. . . . . 9.
Wings brighter, with a heavy brown pattern, especially along the cord.
(Cameroons) *helophila* Alexander.
9. Cell *1st* M_2 small, all veins beyond the cell elongated, approximately twice the cell or longer; R_{1+2} elongate, much longer than cell *1st* M_2.
(Cameroons) *evanescens* Alexander.
Cell *1st* M_2 large, the veins beyond correspondingly shortened, M_4 shorter than the cell; R_{1+2} of moderate length, shorter than cell *1st* M_2. . . . . 10.
10. Thorax entirely black or brownish black; legs entirely black.
(Nigeria) *commutabilis* Alexander.
At least the scutellum and postnotal mediotergite yellow. . . . . 11.
11. Thoracic pleura and most of coxae black or brownish black; abdomen beyond the base black.
(Sierra Leone) *leonensis* Alexander.
Thoracic pleura and coxae chiefly pale; abdomen chiefly yellow, including the hypopygium, the subterminal segments blackened.
(Liberia) *monroviae*, sp. n.
12. Size small (wing 7 mm.); antennae short in both sexes; valves of ovipositor elongate, chitinized; wings whitish, the veins conspicuously seamed with darker.
(Seychelles) *fuscinervis* Edwards.
Size large (wing over 9 mm.); if small in size (*capensis* and allies), antennae of male greatly elongated; valves of ovipositor short and fleshy. . . . . 13.
13. Size small (wing 9 mm. or less); valves of ovipositor short and fleshy; antennae of male greatly lengthened; R_2 before the fork of R_{3+4}, cell R_3 small, vein R_3 much shorter than R_{2+3+4}. . . . . 14.
Size large (wing 11 mm. or more); valves of ovipositor elongate, chitinized; antennae of male greatly lengthened; R_2 at or just beyond the fork of R_{3+4}; cell R_3 elongate, vein R_3 approximately as long as R_{2+3+4}. . . . . 16.
14. General coloration brown; legs yellowish brown, the femora and tibiae tipped with darker.
(Transvaal) *humilis* Alexander.
General coloration black; legs black or brownish black. . . . . 15.
15. Size larger (wing, ♂, 8.5–9 mm.).
(Transvaal) *capensis* Alexander.
Size small (wing, ♂, 7 mm.).
(Nigeria to Nyasaland) *pusilla* Alexander.
16. General coloration shiny black; legs black; wings with the costal margin dark brown.
(Nyasaland) *nyasicola* Alexander.
General coloration gray or brown, the mesonotal praescutum with four darker brown stripes; femora yellowish, narrowly tipped with brown; wings with the costal margin but little suffused. . . . . 17.
17. Wing-pattern more uniform, the stigma small, not preceded and followed by subhyaline areas; R_2 usually equal to or longer than R_{2+3+4}; Rs long, more than twice R_{2+3+4}.
(Sierra Leone to Nyasaland) *tumidiscapa* Alexander.

Wing-pattern conspicuously variegated, with a distinct but restricted dark pattern; stigma preceded and followed by whitish subhyaline areas; R_3 shorter than R_{2+3+4}; *Rs* shorter, only about one-half longer than R_{2+3+4}. (French Congo) *globiceps* Alexander.

Eriocera tumidiscapa Alexander

1920. *Eriocera tumidiscapa* Alexander; Ann. Mag. Nat. Hist., (9) 6: 363–364.

The types were from Sierra Leone and Nyasaland. In the present series, the following Liberian specimens occurred: ♂, Du River, July 28, 1926; ♀, Lenga Town, August 16, 1926 (*J. Bequaert*).

ERIOPTERINI

Conosia irrorata (Wiedemann)

1828. *Limnobia irrorata* Wiedemann; Aussereur. zweifl. Ins., 1 : 574.

A small male from Monrovia, Liberia, July 1926. Other material from Lisala, Belgian Congo, 2° 10′ N., 21° 30′ E., in lowland rain forest, December 1926 (*J. Bequaert*).

Clydonodozus puncticosta Alexander

1920. *Clydonodozus puncticosta* Alexander; Ann. Mag. Nat. Hist., (9) 6 : 341–343.

The type, a female, was from Kambali, Sierra Leone, March 22, 1912, collected by J. J. Simpson. A second female was in the present collection, from Firestone Plantation No. 3, right bank of the Du River, Liberia, July 26, 1926 (*J. Bequaert*).

Clydonodozus schoutedeni, new species

General coloration of thorax fulvous, the praescutum with a capillary brown median line on anterior portion; head brownish black; legs yellow, the femoral and tibial tips narrowly darkened; wings yellowish, with a restricted dark pattern, most evident as a seam along the cord and a marginal suffusion in the radial field; abdominal sternites with an interrupted series of brown dagger-shaped dashes.

Male. — Length about 13 mm.; wing 12 mm.

Described from an alcoholic specimen.

Head brownish black, the palpi and antennae dark brown.

Mesonotum fulvous, the praescutum conspicuously compressed in front, with a capillary dark brown median line that becomes obsolete far before the suture. Pleura chiefly obscure fulvous yellow, the margins of the sclerites somewhat darker. Halteres yellow, the base of the stem a little more dusky. Legs with the outer faces of the coxae slightly darkened; trochanters obscure yellow; femora yellow, the tips narrowly dark brown; tibiae brownish yellow, the tips very narrowly and indistinctly darkened; tarsal segments obscure yellow, the tips of the individual segments distinctly darkened. Wings (male) broad, widest opposite the end of cell *2nd A* as common in this sex of the genus; general coloration yellow, the prearcular and costal regions more saturated; outer margin of the radial field narrowly darkened; stigma small and diffuse, darkened, connected with a narrow vague seam along the cord; an indistinct cloud at origin of *Rs;* less evident clouds at outer end of cell *1st* M_2 and the fork of M_{1+2}; veins chiefly yellow, darker in the clouded areas. Venation: Sc_2 lying proximad of the fork of *Rs; Rs* relatively long, angulated at origin; cell *1st* M_2 of moderate size, its proximal end pointed; *m-cu* lying proximad of the level of *r-m*; cell M_1 subequal to its petiole; vein *2nd A* sinuous at outer end.

Abdominal tergites yellow; sternites concolorous, with a series of median dark brown areas, these broadly interrupted at posterior margins of the segments, strongly constricted at cephalic end of each area; these dagger-shaped marks are clearly defined on sternites three to seven, inclusive; a more or less distinct subterminal dark ring; hypopygium yellow.

Hab. Belgian Congo.

Holotype, alcoholic ♂, Koteli, on the Itimbiri River (between Buta and Djamba), January 20, 1925 (*H. Schouteden*).

Clydonodozus schoutedeni is named in honor of the collector, Dr. H. Schouteden. The species is most similar to species such as *C. angustifasciatus* Alexander, in the wing- and leg-pattern, differing in the coloration of the thorax, wings, and abdomen.

The known Ethiopian species of *Clydonodozus* may be separated by the following key:

1. Costal cell of wing with a series of ten or more supernumerary crossveins and spurs..... 2.
Costal cell of wing without such supernumerary crossveins and spurs.................. 3.

2. General coloration of mesonotum reddish brown; cells of wing excepting cell C without dark spots and dots; femora dull yellow, the tips narrowly darkened.
(Sierra Leone, Liberia) *puncticosta* Alexander.
General coloration of mesonotum ashy-gray; wings with a series of abundant brown spots and dots along all veins; legs chiefly brownish black, only the femoral bases somewhat paler.
(Belgian Congo: Upper Uele) *cinereithorax* Alexander.

3. Wings with a very extensive brown pattern, there being a broad crossband along the cord that completely fills cell *1st* M_2 .... 4.
Wings with the dark pattern less extensive, at least the center of cell *1st* M_2 pale...... 5.

4. Femora yellow, the tips blackened, with a conspicuous brownish black subterminal ring; wing-disk beyond the cord largely pale, the brown spot at fork of M_{1+2} not connected with the other dark areas.
(Kenya Colony) *pulchripes* Alexander.
Femora yellow, the tips abruptly blackened, but with no subterminal darkening; wing-disk beyond the cord extensively clouded, the areas confluent.
(Belgian Congo) *neavei* Alexander.

5. Legs with the femora dark brown or black with only the bases pale; wings yellowish with the costal margin more or less infuscated, at least distally; other veins of wing less heavily seamed with dusky; usually with no transverse dark band along cord..... 6.
Legs with the femora yellow, the extreme tips narrowly darkened; wings yellowish, the costal cell concolorous or more saturated yellow; a more or less distinct dark seam along the cord.. 8.

6. Costal border of wing broadly and conspicuously dark brown, the remainder of wing almost uniformly pale.
(Belgian Congo: Upper Uele) *fumicostatus* Alexander.
Costal border of wing only narrowly or inconspicuously darkened, usually more so at outer end, the remainder of wing with a distinct pattern.......................... 7.

7. Wings streaked longitudinally with brown, the costal region infuscated, interrupted at the stigma by the pale yellow cell Sc_1; cell *1st* M_2 more elongate, its proximal end pointed; R_{2+3+4} very short to lacking.
(Uganda) *pallidistigma* Alexander.
Wings clouded and banded along the cord; costal region infuscated, the stigma dark brown; cell *1st* M_2 short, the basal section of M_{1+2} subequal to the second section; R_{2+3+4} subequal to or longer than *m-cu*.
(Ashanti, Cameroon, French Congo) *brevicellula* Alexander.

8. Mesonotal praescutum with three or four distinct black or brownish black stripes..... 9.
Mesonotal praescutum fulvous, unmarked or with a central darkening on anterior portion only... 10.

9. Median praescutal stripe entire; abdomen with a nearly continuous brownish black median stripe on sternites.
(Uganda) *angustifasciatus* Alexander.
Median praescutal stripe divided by a pale vitta, producing four stripes; abdomen with the median vitta on sternites broken into brown dashes.
(Uganda) *interruptus* Alexander.

10. Tibiae conspicuously dark brown; *Rs* relatively short, less than R_3. (Cameroon) *fulvithorax* Alexander.
Tibiae yellow, the tips weakly darkened; *Rs* longer than R_3. (Belgian Congo: Itimbiri) *schoutedeni*, sp. n.

Lecteria triacanthos Alexander

1920. *Lecteria triacanthos* Alexander; Ann. Mag. Nat. Hist., (9) 5 : 59–61.

Several of both sexes from Firestone Plantation No. 3, right bank of the Du River, Liberia, July 26, 1926 (*J. Bequaert*).

Trentepohlia (Trentepohlia) speiseri africana, new subspecies

Female. — Length about 7–8 mm.; wing 6 mm.

Described from alcoholic specimens.

Differs from typical *speiseri* Edwards (Ann. Mag. Nat. Hist., (8) 12 : 204, fig.; 1913) of southern Asia chiefly in details of coloration.

Rostrum pale, both palpi dark brown. Antennae dark brown throughout. Mesonotal praescutum reddish yellow with three well-indicated brown stripes; scutellum and postnotum darker brown. Pleura dark brown. Legs chiefly yellow, the tips of the femora and tibiae slightly darkened; posterior tibiae (♀) with three powerful black setae just before tips; terminal tarsal segments darkened. Wings with a heavy brown pattern, the area above the anterior cord very broad, reaching the costa and without a pale center; pale central area of cell R_3 very restricted; brown seams along the cord, *Cu* and R_5 very broad and conspicuous. Venation: *Rs* subequal to the basal section of R_5.

Hab. Tropical Africa, LIBERIA.

Holotype, alcoholic ♀, Firestone Plantation No. 3, right bank of the Du River, July 27, 1926 (*J. Bequaert*).

I feel assured that the African material that has been referred to *speiseri* represents at least a distinct race, characterized by the distinct praescutal stripes and the more darkened tips to the femora and tibiae. Edwards (*loc. cit.*) recorded it from the Gold Coast, Sierra Leone, Belgian Congo, and Uganda. Speiser (Berlin. Ent. Zeitschr., 52 : 135; 1907, as *exornata*) recorded it from Cameroon. I have seen it from several Cameroon stations and the fly appears to be common and widely distributed. By my key to the African species of *Trentepohlia* (Rev. Zool. Afric., 14 : 177–180; 1926), the form runs to *speiseri*, but difficulties are encountered at couplet 21 because of the slightly darkened femoral tips.

Trentepohlia (Mongoma) albilata Alexander

1920. *Trentepohlia* (*Mongoma*) *albilata* Alexander; Ann. Mag. Nat. Hist., (9) 5 : 56–58.

One of each sex from the Firestone Plantation No. 3, right bank of the Du River, Liberia, July 27, 1926 (*J. Bequaert*).

Gonomyia (Gonomyia) liberiensis, new species

General coloration dark brown; antennal scape pale yellow above, dark brown beneath; thoracic pleura striped longitudinally with whitish; femora with a broad subterminal brown ring; wings grayish, variegated with whitish and darker brown; outer radial and medial cells uniformly grayish; posterior margins of abdominal segments whitened; male hypopygium with three dististyles, the outer two elongate and chitinized.

Male. — Length about 4 mm.; wing 3.5 mm.

Female. — Length about 5 mm.; wing 4–4.2 mm.

Described from alcoholic specimens.

Rostrum and palpi brownish black. Antennae with the scapal segments pale yellow above, dark brown beneath; basal flagellar segments yellow, short and crowded, with short verticils; outer flagellar segments dark brown, linear, with very long verticils, as in this sex in many species of the genus. Head above pale, the center of the vertex darkened.

Mesonotal praescutum and scutum dark brown, paler laterally; scutellum dark brown, abruptly and conspicuously margined with whitish; postnotum dark. Pleura chiefly dark brown, with a broad whitish longitudinal stripe extending from and including the fore coxae, passing above the other coxae to the abdomen; dorsal pleurites somewhat paler brown than the sternopleurite and meron. Halteres pale, the knobs infuscated. Legs with the coxae pale, the middle and hind coxae narrowly darkened basally; femora brownish yellow, brighter basally, with a broad darker brown subterminal ring, the tips narrowly pale yellow; tibiae brownish yellow, the tips narrowly darkened; tarsi passing into dark brown. Wings with a grayish tinge, sparsely variegated with whitish subhyaline and darker brown; stigma brown, connected with a vague seam along the cord; narrower seams at origin of *Rs*; outer end of cell *1st* M_2 and on R_3; prearcular region, cell *C* and conspicuous areas before and beyond the stigma whitish; ends of radial and medial cells not pale, as in *sobrina;* a vague transverse paling across the wing-disk just beyond the cord; veins pale brown, darker in the infuscated areas. Venation: Sc_1 ending shortly before the origin of *Rs*, Sc_2 not far from its tip; R_3 nearly perpendicular at origin, the cell relatively small; *m-cu* just before the fork of *M*.

Abdominal segments dark brown, the caudal margins of the segments narrowly white. Male hypopygium with three distinct dististyles, the outermost a long, simple flattened blade; second style shorter, entirely blackened, curved into a crook at apex; inner style small, pale and fleshy, setiferous, terminating in two stouter setae. Gonapophyses appearing as flattened rods, the tips narrowed into glabrous blackened spines, divergent, their bases pale, clothed with abundant yellow setulae.

Hab. LIBERIA.

Holotype, alcoholic ♂, Banga, September 7, 1926 (*J. Bequaert*). *Allotopotype*, ♀. *Paratopotypes*, 1 ♂, 2 ♀♀.

Gonomyia liberiensis is allied to *G.* (*G.*) *noctabunda* Alexander and *G.* (*G.*) *sobrina* Alexander, differing conspicuously from the former in the structure of the male hypopygium. Unfortunately, *sobrina* is still known only from the unique type female. It differs from the present species in the wing-pattern and details of coloration.

Podoneura Bergroth

1888. *Podoneura* Bergroth; Entomol. Tidskr., 9: 133, fig. 2.
1914. *Podoneura* Riedel; Voy. Alluaud et Jeannel en Afrique Orientale, Ins. Dipt. 3, Nematocera polyneura, p. 83.
1917. *Podoneura* Alexander; Ann. South African Mus., 17 : 151, pl. 10, fig. 14.
1921. *Podoneura* Alexander; *Ibid.*, 18 : 197.

The genus *Podoneura* was proposed for the single species, *P. anthracogramma* Bergroth, from Cape Colony. Later, Riedel recorded the species from Kenya and Tanganyika (Kilimanjaro, at high altitudes, 2,400–3,000 meters). Still more recently I have recorded it from several additional stations in South Africa.

A second species, *P. brevifurcata* Alexander, has recently been described from N'gwese, Lake Kivu, in the Belgian Congo. The discovery of the very distinct new species described herein as *P. bequaertiana* is of unusual interest. The three species of the genus now known may be separated by the following key:

1. The fork of vein *2nd A* very small, the longer or cephalic branch only a little greater than *m-cu* and without macrotrichia; *m-cu* less than its own length before the fork of *M*. (Fig. 10, *8*). *brevifurcata* Alexander.

The fork of vein *2nd A* larger and more sprawly, the longer branch approximately twice *m-cu* and provided with macrotrichia; *m-cu* more than its length before the fork of *M*.. 2.

2. Legs variegated, black, all femora with the apex and a subterminal ring yellow. (Fig. 10, *7*). *anthracogramma* Bergroth.

Legs uniformly blackened. (Fig. 10, *6*). *bequaertiana*, sp. n.

The wing-pattern (Fig. 10, *6*, *7*, *8*) of all three species is very similar. The character of a spur within cell *1st* M_2, together with the shape of the fork of vein *2nd A* is probably a variable character or else there remain still other species close to *anthracogramma* to be defined.

Podoneura bequaertiana, new species

Text Fig. No. 10, *6*

Characters as in *P. anthracogramma;* legs entirely black.

Male. — Length about 5 mm.; wing 6 mm.

Described from an alcoholic specimen.

Rostrum pale; palpi dark brown. Antennae with the scape light yellow, the flagellum brownish black; flagellar segments oval, the outer segments more elongate. Head dark, the orbits more pruinose.

Mesonotal praescutum and scutum chiefly dark, probably pruinose in fresh specimens; scutellum chiefly obscure yellow, darkened medially at base; postnotum dark. Pleura chiefly pale, variegated longitudinally with dark brown, this including extensive areas on the sternopleurite and meron; a narrower, more dorsal, dark stripe. Halteres pale, the base of the knobs dark brown, the tips conspicuously pale. Legs with the fore coxae and trochanters dark brown; remaining coxae and trochanters brownish yellow; remainder of legs uniformly brownish black, the femora unvariegated. Wings (Fig. 10, *6*) relatively narrow, the ground-color creamy, with a conspicuous but restricted grayish brown pattern, appearing as seams at origin of *Rs;* Sc_2; R_2, connecting posteriorly with a seam along the cord; outer end of cell *1st* M_2; *m-cu;* rounded marginal clouds at ends of veins R_{1+2}, R_3, M_3 and all remaining veins, including the forked second anal vein; apical clouds on R_4, R_5, and M_{1+2} much less distinct; veins pale, darker in the infuscated areas. Venation: Sc_1 ending opposite *r-m; Rs* long and straight; a conspicuous spur at union of *m* and M_3, jutting basad into cell *1st* M_2, much as in *Hoplolabis; m-cu* far before the fork of *M;* fork of vein *2nd A* about as in *anthracogramma* Bergroth.

Abdominal tergites dark brown, the sternites a little paler. Male hypopygium with the outer dististyle long and slender, gradually narrowed to an acute point, at near two-thirds the length on outer margin with a small acute lateral branch. Inner dististyle shorter, appearing as a broadly flattened blade, its apex obtuse. Gonapophyses blackened, appearing as simple horns, narrowed to slender curved points.

Hab. BELGIAN CONGO (Kivu).

Holotype, alcoholic ♂, Lukumi Camp, northern slope of Mt. Karisimbi, altitude 11,370 feet, in subalpine zone, *Erica* formation, March 19, 1927 (*J. Bequaert*).

I take great pleasure in dedicating this fine new *Podoneura* to Dr. Bequaert, to whom I am greatly indebted for many favors in the past.

Teucholabis rubrithorax Alexander

Text Fig. No. 10, *10*

1920. *Teucholabis rubrithorax* Alexander; Ann. Mag. Nat. Hist., (9) 6 : 25–26.

The unique type was from Aburi, Gold Coast, collected by W. H. Patterson. In the present series, a male, Du River, Liberia, July 26, 1926 (*J. Bequaert*).

The thorax is as in the type with the exception of a small dark spot on the posterior lateral portions of the praescutum. The wing-pattern is shown (Fig. 10, *10*). The male hypopygium is very similar in structure to *T. nodipes* Speiser, but the coloration of the body and wings is very different.

Teucholabis nodipes nodipes Speiser

1913. *Teucholabis nodipes* Speiser; Deutsch. Ent. Zeitschr., 1913 : 136–137, fig. 7.

The types were from Duala, Cameroon, collected in July. In the present collection, a male from Suahkoko, Liberia, eighty miles northeast of Monrovia, September 5, 1927 (*J. Bequaert*).

Teucholabis nodipes praescutellaris, new subspecies

Text. Fig. No. 10, *9*

Male. — Length about 6.5–7 mm.; wing 5.5–6 mm.

Female. — Length about 7 mm.; wing about 5–5.2 mm.

Generally similar to *T. nodipes* Speiser, differing only in details of the coloration. The orange color of the pronotum is extended caudad to include the whole anterior fourth of the praescutum. Fore coxae orange, middle and posterior coxae black; fore and middle trochanters orange, posterior trochanters black. The wing is shown (Fig. 10, *9*).

Hab. Liberia.

Holotype, alcoholic ♂, Firestone Plantation No. 3, right bank of the Du River, July 26, 1926 (*J. Bequaert*). *Allotopotype,* ♀, in copula with the type. *Paratopotype,* 1 ♂.

The African species of *Teucholabis* may be distinguished as follows:

1. Mesothorax chiefly shiny black, this including the posterior coxae .... 2.
Mesothorax shiny reddish, including the coxae .... 3.
2. Mesothorax entirely shiny black, the fore and middle coxae orange.
(Liberia, Cameroon, French Congo) *nodipes nodipes* Speiser.
Mesothorax with anterior fourth of the praescutum orange; middle coxae black.
(Liberia) *nodipes praescutellaris,* subsp. n.
3. Brown markings on the wing extensive, the dark apex subequal to the pale subapical band; dark band along cord broad.
(Ashanti) *latifascia* Alexander.
Brown markings on the wing less extensive, the dark apex scarcely one-half as wide as the pale subapical band; dark band along cord narrow.
(Liberia, Gold Coast) *rubrithorax* Alexander.

Ceratocheilus gilesi Edwards

1911. *Ceratocheilus gilesi* Edwards; Ann. Mag. Nat. Hist., (8) 8 : 283.

The type was taken at sea off the West African coast. Two specimens in the present collection from Monrovia, Liberia, July 1926 (*J. Bequaert*). The species is now known to have a wide range in West Africa.

Ceratocheilus longirostris Wesché

1910. *Ceratocheilus longirostris* Wesché; Journ. Linn. Soc. London, 30 : 359, figs. 4, 10.
1919. *Ceratocheilus nigripleura* Alexander; Bull. Mus. Hist. Nat. Paris, 1919 : 611.

One male, from Lukolela, Belgian Congo, 1° 10′ S., 17° 10′ E., in lowland rain forest, taken at light, December 16, 1926 (*J. Bequaert*).

The African species of *Ceratocheilus* may be separated by the accompanying key:

1. Wings unspotted.
(West Africa) *gilesi* Edwards.
Wings spotted or clouded with darker .... 2.
2. Anterior branch of *Rs* very short and straight so that cell R_2 is almost triangular in outline; a series of four equidistant brown spots in cell *M;* rostrum light yellow.
(Ivory Coast, Cameroon) *flavirostris* Alexander.
Anterior branch of *Rs* longer, cell R_2 not triangular in outline; no series of brown spots in cell *M;* rostrum dark .... 3.
3. Anterior branch of *Rs* very long, subequal to the combined *Rs* and basal section of R_5; wing-pattern very heavy, dark brown, including a large U-shaped mark at tips of *Sc* and R_{1+2}, this extending caudad to vein *M* or virtually so; a heavy dark area at arculus reaches costa.
(Southern Nigeria, Cameroon) *edwardsi* Alexander.
Anterior branch of *Rs* shorter; wing-pattern less distinct, the area at tip of *Sc* not extended caudad to vein *M;* arcular area, when present, small and not reaching costa. 4.
4. Wing-markings faint; no brown spot surrounding Sc_2.
(Seychelles) *seychellarum* Edwards.
Wing-markings more distinct; a brown spot surrounding Sc_2 .... 5.
5. At least three dark brown areas reach costa, situated at tips of Sc_1, R_{1+2} and R_3; rostrum longer (in male, about 5 mm.).
(Liberia to Belgian Congo) *longirostris* Wesché.
A single dark costal mark, placed at tip of R_{1+2}; rostrum shorter (in male, about 3 mm.).
(Southern Nigeria to Belgian Congo) *cornigerum* (Speiser).

Ceratocheilus flavirostris is the most distinct of the Ethiopian species. The remaining five represent a closely allied group that are separated chiefly on details of the wing-pattern, being arranged in the following order, from the first, with immaculate wings, to the last with the most heavily patterned wings: *gilesi*, *seychellarum*, *cornigerum*, including *winn-sampsoni* Wesché, *longirostris*, including *nigripleura* Alexander, and *edwardsi*.

Styringomyia liberiensis, new species

Text Fig. No. 10, *13*

Male. — Length about 7–8 mm.; wing 5–5.5 mm.

Female. — Length about 6 mm.; wing 4.6–4.7 mm.

Described from alcoholic specimens.

Allied to *S. annulipes* Enderlein (East Africa, Madagascar, Seychelles), *S. occidentalis* Edwards (Gold Coast), and *S. mahensis* Edwards (Seychelles) in the prominent lateral shoulders on the ninth tergite of the male hypopygium, differing especially in the details of structure of the hypopygium.

Antennae with both scapal segments black, the flagellum yellow. Head dark. Mesonotum chiefly pale, variegated with dark lines. Legs yellow, the femoral and tibial rings narrow and relatively ill-defined, the femoral rings much narrower than the pale ring enclosed. Wings yellow, with a sparse brown pattern, as in *annulipes;* anterior branch of *Rs* entirely pale; vein *2nd A* spurred at origin. Abdomen chiefly pale, variegated, especially caudally and laterally, with brown. Male hypopygium (Fig. 10, *13*) with the lateral shoulders of the ninth tergite nearly straight, blackened only at tips, clothed with setae to the blackened portions. In *mahensis* and allies the shoulders are blackened almost to their bases, setiferous only on the proximal portion and strongly incurved. Ninth sternite narrowed to the simple apex, bearing two long approximated setae. Basistyle with the lateral apical lobe long, fully one-half the length of the apical seta. In *mahensis*, the lobes are very short, much less than the weak apical seta. The complex dististyle is about as figured, the details quite distinct from *mahensis* and allies.

Hab. LIBERIA.

Holotype, alcoholic ♂, Monrovia, July 8, 1926 (*J. Bequaert*). *Allotopotype,* ♀, July 8, 1926. *Paratopotypes,* 2 ♂♂, July 8, 1926.

Styringomyia dendroides, new species

Text. Fig. No. 10, *14*

Male. — Length about 6–6.5 mm.; wing about 3.8–4 mm.

Female. — Length about 5.5 mm.; wing about 3.6–3.7 mm.

Described from alcoholic specimens.

Palpi extensively pale, especially the terminal segment. Antennae with the first scapal segment dark beneath, pale dorsally; second segment dark; flagellum chiefly pale. Head pale.

Pronotum dark, extensively pale medially. Mesonotum chiefly pale yellow, rather delicately marked with brown lines; praescutum with the delicate median brown vitta divided behind; scutal lobes narrowly ringed with brown; scutellum pale; postnotal mediotergite dark with a pale median vitta. Pleura yellow. Legs with the dark femoral rings well-marked but narrow and occurring on the upper half only, the entire ventral surface of femora immaculate; tibial rings similarly distinct. Wings yellow, with a sparse brown pattern, including spots or seams at *r-m;* fork of M_2 and M_3; *m-cu* and the distal end of vein *2nd A;* veins yellow, dark in the infuscated areas. Venation: Vein *2nd A* simple, the cell broad.

Abdomen yellow, the tergites with geminate brown spots on caudal margin, these somewhat more extensive on the subterminal segments; less evident brown lateral lines on segments; hypopygium pale; sternites immaculate. Male hypopygium (Fig. 10, *14*) with the ninth tergite a broad simple lobe, the caudal margin narrow and obtuse, densely set with setae. Ninth sternite pale, the apex simple, bearing two long setae that are obliquely placed on apex. Basistyle terminating in a small acute pale spine, the opposite angle produced into a stout lobe that bears the usual seta, this unusually broad and flattened. Dististyle complex, shaped about as in the figure, the innermost arm unusually slender and bearing spines and branches along the entire length. Aedeagus appearing as two blackened obtuse lobes (not figured).

Hab. LIBERIA.

Holotype, alcoholic ♂, Monrovia, July 8, 1926, at light (*J. Bequaert*). *Allotopotype,* ♀. *Paratopotypes,* 2 ♂♂.

By Edwards' key to the species of *Styringomyia* (Trans. Ent. Soc. London, 1914 : 210–212; 1914), the present form runs to and beyond couplet 16 which includes only Asiatic species. *S. dendroides* is amply distinct from the regional species in the structure of the male hypopygium, especially the dististyle.

Styringomyia vittata Edwards

1914. *Styringomyia vittata* Edwards; Trans. Ent. Soc. London, 1914 : 217–218, figs. 23, 60–63.

A pair, Firestone Plantation No. 3, right bank of the Du River, Liberia, July 26, 1926 (*J. Bequaert*). This is one of the most common and widely distributed species of the genus, ranging from West Africa to Natal.

REPORT UPON CERTAIN ECTOPARASITES OF MAMMALS

By Professor G. F. Ferris, Stanford University, California

Dr. J. Bequaert has submitted to me the ectoparasites of mammals collected by the Harvard African Expedition, which are herewith reported upon. The collection is small, but it contains material of exceptional interest. I have included in the report certain other material having a definite bearing upon that collected by the Expedition, this consisting of specimens taken by me some years ago from mammal skins in the United States National Museum. The types of the new species will be deposited at the Museum of Comparative Zoölogy, Cambridge, Massachusetts.

HEMIPTERA

POLYCTENIDAE

Of one of those rare parasites of bats belonging to the hemipterous family Polyctenidae, three specimens are included. Thanks to the careful work of Jordan, it is possible to identify these quite positively.

Eoctenes nycteridis (Horváth)

Text Fig. No. 12

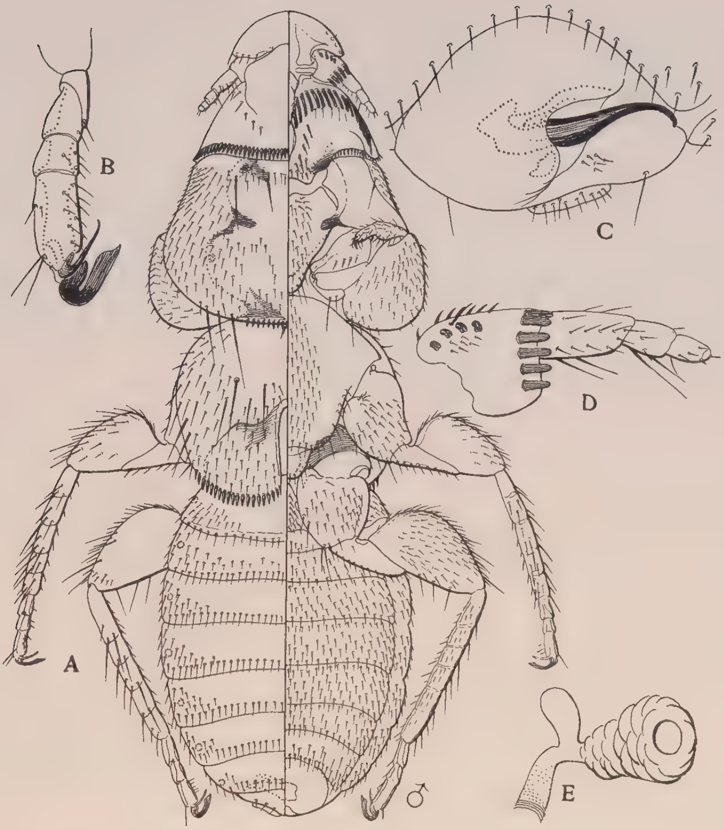
1910. *Ctenoplax nycteridis* Horváth, Ann. Mus. Nat. Hungarici 8, p. 572; Pl. 14, figs. 2–5.
1912. *Eoctenes nycteridis* Horváth, Jordan, Novitates Zoologicae 18 : 575–576; Pl. 13, figs. 5–8 (♀).

Previous Records. Thus far known only from one immature and five mature specimens, the adults all females from "bat," Entebbe, Uganda, and from *Nycteris hispida*, Shirati, southeastern shore of Lake Victoria.

Present Record. A single adult male and two nymphs that seem certainly to belong to the same species, from *Petalia arge* (Thomas), Du River, Camp No. 3, Liberia (J. Bequaert).

Notes. The species being at present known only from the female and nymphs it seems worth while to figure the male. The single adult specimen agrees closely with the description and figures given by Jordan, except in certain minute and undoubtedly insignificant details. According to this author the prosternum in the female is slightly emarginate at the tip, while in this specimen it is merely broadly rounded. Apparently also the specimen at hand has a smaller number of teeth in the pronotal comb. The beak of the adult is apparently but three-segmented — as is described for the species — but in the two nymphs it is clearly four-segmented, although Jordan describes the single nymph examined by him as having the beak three-segmented.

I do not know that the spiracles have been described for any species of this group. I have here figured an abdominal spiracle (Fig. 12*E*). The other figures will supplement those given by Jordan.



TEXT FIGURE 12. — *Eoctenes nycteridis* (Horváth): *A*, Male; *B*, tarsus of middle leg; *C*, general appearance of genitalia; *D*, antenna; *E*, spiracle

MALLOPHAGA

A. THE MALLOPHAGAN FAUNA OF THE MAMMALIAN FAMILY PROCAVIIDAE

The material forwarded by Dr. Bequaert included one bottle containing great numbers of Mallophaga labelled as from *Procavia* (*Dendrohyrax*) *adolfi-friederici* Brauer, Lulenga, Belgian Congo, March 2, 1927 (J. Bequaert). This one bottle contained six quite distinct species of the family Trichodectidae. This material, together with other specimens that are at hand, makes possible a review of the Mallophagan fauna of the Procaviidae (Hyracidae). There are in connection with this fauna certain aspects of very considerable interest.

As has many times been pointed out, the distributional problems associated with the ectoparasites of birds and mammals are among the most interesting phases of the study of these groups of insects. It would be out of place here to enter into a general discussion of these problems, but I may call attention to that particular one which is most beautifully illustrated by the material at hand.

The distribution of such ectoparasites as the Mallophaga and Anoplura is biologically practically analogous to that of island species. Biologically each host species is in effect an island which received its complement of species at the time when it separated from its original mainland, the parent stock. Since that time it may possibly have received additions to its fauna by accidental means but in most cases such accidents seem not to have occurred.

Upon the host island the factor of isolation has been at work and thus it follows that in general the parasite species upon widely different groups of birds or mammals are quite different, while those upon closely related hosts are very similar or even identical. It follows also that in general two or more very closely related species of parasite do not occur upon the same animal. This is quite in accord with the generally accepted dictum of students of distribution which holds that two very closely related species are usually found not in exactly the same region but in neighboring regions. Upon the very limited area represented by the body of an animal, with its ecologically uniform conditions, it is difficult to see how two closely related species could arise, the factor of isolation being entirely non-operative.

Nevertheless, there are a few cases where two or even more quite closely related species of parasites occur upon the same host species. The most remarkable of such cases that is known to me is that represented by the material at hand from the Procaviidae, specifically that in the bottle received from Dr. Bequaert. *Here we have six species, some of which at least are quite closely related, occurring together upon a single host individual.* Furthermore these are but a part of the species of the same group that occur upon the Procaviidae and as far as the present evidence goes these species are more or less generally and promiscuously distributed over the members of the family. It would seem that such a case merits a considerable degree of attention.

I shall not here enter into any speculation concerning the possible reasons for the origin of a condition that departs so widely from the normal. I shall, however, figure in detail and discuss the species involved in order to present the data concerning the case.

TRICHODECTIDAE

All of the Mallophaga in question belong to the family Trichodectidae, the members of which are distinguished from all other Mallophaga by a number of characteristics, but most obviously by the possession of one-clawed tarsi. All of the members of the family occur upon mammals, between seventy and eighty species being known.

No careful study of the entire family has ever been made. Consequently, although it is possible to recognize groups of species, it is not possible at present to indicate generic groupings with any feeling of security. Certain genera have indeed been segregated from *Trichodectes*, but on very unconvincing grounds. Two genera, however, *Trichophilopterus* and *Eurytrichodectes*, are unquestionably valid. The latter of these includes a species that comes within the range of our attention here.

Because of the existing conditions, which demand a complete review of the Trichodectidae before the naming of genera is undertaken, I shall not attempt to remove any of the forms at hand from *Trichodectes*, although I am inclined to believe that some of them have more in common with *Eurytrichodectes*.

Eleven species have been recorded from the family Procaviidae. Of these, I regard one as unrecognizable. Eight species are present in the material at hand of which three are described as new, making a total of fourteen species from this host family. Owing to the occurrence of so many species upon the same hosts, it is at times a very difficult matter properly to associate males and females with their rightful partners, especially if they are found at different times or come from different hosts or localities. In the material at hand, fortunately, the many specimens taken together permit critical comparisons and I feel reasonably sure of the associations that are here made. It appears that, although there is a marked sexual dimorphism, there are always certain characteristics which are constant in both sexes and which may be relied upon to correlate them. It is evident that previous authors have in at least two cases associated males and females of quite different species.

These factors, combined with the inadequacy of descriptions which fail to note important and essential characters, even while dealing at length with non-essential details, and figures which are lacking in precision, have resulted in producing something of a tangle that even yet cannot be entirely cleared up. It is hoped, however, that the present essay will make some progress toward the elucidation of the problem.

The species represented in the material at hand may be separated upon the basis of the following keys. Some other species are included on the basis of the literature.

MALES

1. Claws of the middle and posterior legs spinose-serrate on the inner face .... 2.
Claws of these legs smooth on the inner face .... 5.
2. Anterior margin of the head without a distinct median notch ....
.... ? *Trichodectes diacanthus* Ehrenberg.
Anterior margin of the head with a distinct median notch .... 3.
3. Preputial sac of the genitalia with several large teeth near its apex. *Trichodectes lindfieldi* Hill.
Preputial sac with but minute teeth .... 4.
4. Head with small, rounded processes on the posterior lobes. *Trichodectes dendrohyracis* n. sp.
Head with the posterior margin straight .... *Trichodectes oculatus* Bedford.
5. Head very broad and short, wider than long .... *Eurytrichodectes paradoxus* Stobbe.
Head with length and breadth at least subequal .... 6.
6. Anterior margin of the head without a distinct notch .... 7.
Anterior margin of the head with a distinct notch .... 9.
7. Male as yet unknown, but by analogy with the female probably with the posterior lobes of the head strongly produced and with the intersegmental membranes of the abdomen granulate .... *Trichodectes granulatus* n. sp.
Posterior lobes of the head small and broadly rounded, intersegmental membranes of the abdomen not granulate .... 8.
8. Terminal complex of genitalia large and conspicuous .... *Trichodectes serraticus* Hill.
Terminal complex of genitalia (as indicated in published figure) very small ....
.... *Trichodectes robertsi* Bedford.
9. Posterior lobes of the head conspicuously produced, slender and acute, preputial sac of genitalia with very large, flat teeth throughout its length ....
.... *Trichodectes univirgatus* Neumann.
Posterior lobes of head at most but slightly produced, preputial sac without such teeth. 10.

[illegible] LIBRARY · TUCSON, [illegible]

10. Pseudopenis represented only by the bases of its arms.. *Trichodectes sternatus* Bedford and *T. emarginatus* Bedford.
Pseudopenis entire, Y-shaped.. 11.
11. Arms of the basal plate articulating to the tips of the arms of the pseudopenis; basal plate not attaining the thorax............................ *Trichodectes congoensis* n. sp.
Arms of the basal plate articulating to the sides of the arms of the pseudopenis, basal plate extending even into the thorax........................ *Trichodectes baculatus* n. sp.

FEMALES

From this key it is necessary to omit the species *Trichodectes robertsi* Bedford, *T. emarginatus* Bedford, and *T. baculatus* n. sp., of which the females are unknown.

1. Claws of middle and posterior legs spinose-serrate on inner face...................... 2.
Claws of middle and posterior legs smooth.. 4.
2. Anterior margin of head without distinct median notch ?*Trichodectes diacanthus* Ehrenberg.
Anterior margin of head with a distinct median notch.............................. 3.
3. Abdomen with a distinct, internal, sclerotic sac of cylindrical form.. *Trichodectes lindfieldi* Hill.
Abdomen with an internal sac, but this not cylindrical.... *Trichodectes dendrohyracis* n. sp.
4. Head distinctly wider than long...................... *Eurytrichodectes paradoxus* Stobbe.
Head with width at least subequal to length....................................... 5.
5. Head without a distinct anterior notch... 6.
Head with a distinct anterior notch.. 7.
6. Intersegmental membranes of abdomen granulate........... *Trichodectes granulatus* n. sp.
Intersegmental membranes of abdomen not granulate......... *Trichodectes serraticus* Hill.
7. Posterior lobes of the head with small and rather transparent but clearly distinct processes. .... *Trichodectes univirgatus* Neumann.
Posterior lobes of head without such processes.................................... 8.
8. First apparent sternite of the abdomen with a heavily sclerotic transverse bar extending from side to side.................................. *Trichodectes sternatus* Bedford.
First apparent sternite of abdomen without such bar........ *Trichodectes congoensis* n. sp.

Eurytrichodectes paradoxus Stobbe

Text Fig. No. 13

1913. *Eurytrichodectes paradoxus* Stobbe, Entomologische Rundschau 30:111; figs. 3–5.

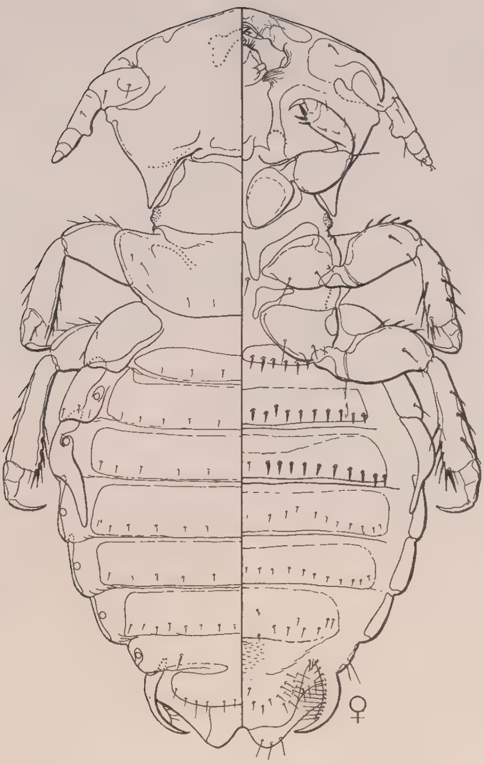
PREVIOUS RECORDS. Known only from the record by Stobbe, from *Dendrohyrax* sp., in the Berlin Museum, without nearer indication of origin.

PRESENT RECORD. A single female and two nymphs from *Procavia adolfifriederici*, Lulenga, BELGIAN CONGO, March 2, 1927 (J. Bequaert).

NOTES. The accompanying figure will supplement the rather inadequate figures given by Stobbe. Unfortunately no male is available. While the species appears at first glance very peculiar and certainly should be separated generically from *Trichodectes*, I am inclined to believe that it is actually not so remote from some of the species here dealt with. It impresses me as belonging to the same stock as do some of the other species infesting the Procaviidae.

Trichodectes diacanthus Ehrenberg

1828. *Trichodectes diacanthus* Ehrenberg, Symbolae Physicae.
1913. *Eutrichophilus diacanthus* (Ehr.) Stobbe, Sitzungsberichten der Gesellschaft naturforschender Freunde, Berlin 8:382; tf. 9.
1928. *Eutrichophilus diacanthus* (Ehr.) Bedford, Report Director Veterinary Education and Research, Union of South Africa, 13–14:848; pl. 2, f. 6.



Text Figure 13. — *Eurytrichodectes paradoxus* Stobbe, female

Previous Records. Known only from the original record by Ehrenberg, which in the available literature is given merely as from *Procavia* (= *Hyrax*) *syriacus* without indication of locality, and from a single female from *Procavia capensis coombsi*, Rooikrans, Transvaal, considered by Bedford to be this species.

Notes. Stobbe (ref. cited) has given some notes on this species, based upon Ehrenberg's types which are still in the Berlin Museum. The figure accompanying the note is merely a crude outline, but the head form of the species is very distinctive and would make its recognition easy if it were not that apparently there are two closely related species of this same type. These two are *Trichodectes serraticus* Hill and that considered by Bedford to be *T. diacanthus*.

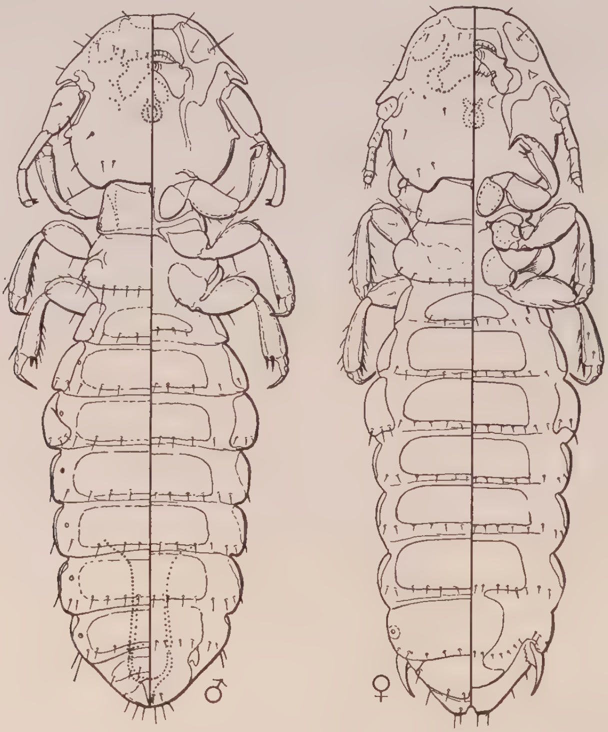
As far as can be determined from the figure given by Bedford — which is far from being precise and definite — and from his statements, his specimen differs from what I take to be *T. serraticus* only in having the claws of the middle and posterior legs spinose-serrate. It may be noted that he records his specimen as occurring in company with a male of *T. serraticus*, which is perhaps not at all significant.

Trichodectes serraticus Hill

Text Figs. Nos. 14 and 15

1922. *Trichodectes serraticus* Hill, Parasitology 14 : 67; pl. 2, figs. 7–9.
1928. *Trichodectes serraticus* Hill, Bedford, Report Director Veterinary Education and Research, Union of South Africa 13–14 : 848.

Previous Records. Recorded by Hill from *Procavia capensis*, Mtabamhlopi, Natal, and by Bedford from a single male from *Procavia capensis coombsi*, Rooikrans, Transvaal.



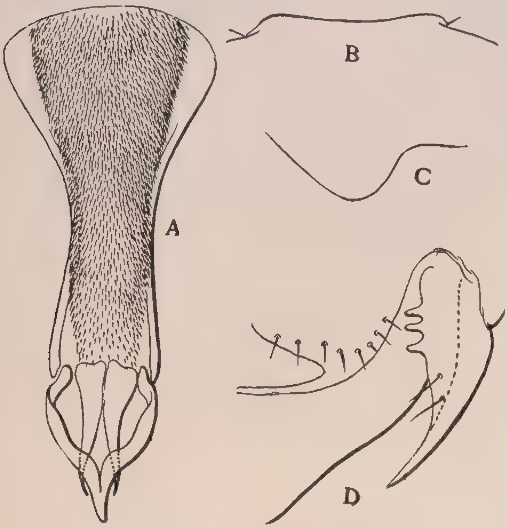
Text Figure 14. — *Trichodectes serraticus* Hill, male and female

Present Record. Specimens that I take to be this species from *Heterohyrax pumila rudolfi*, Marsabit Road, British East Africa, and *H. brucei bakeri*, Nimule, Uganda (all from United States National Museum).

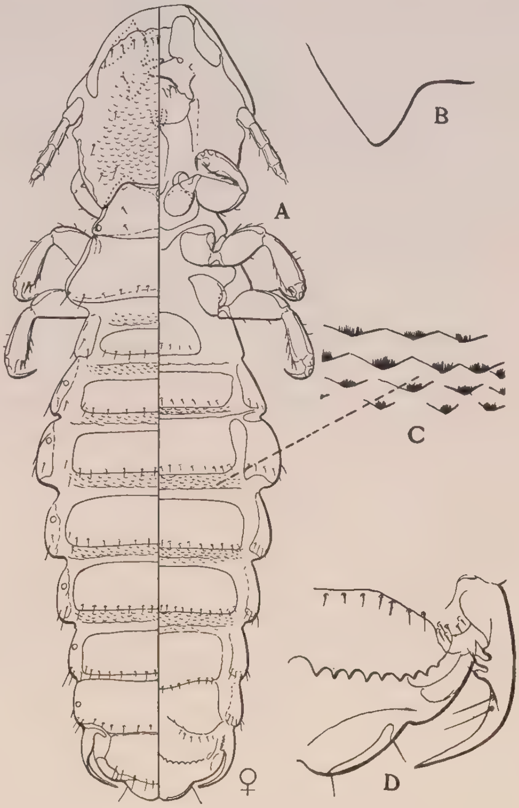
Notes. If taken at their face value the figures given by Hill indicate clearly that he had at hand the male and female of different species, for his figure of the female shows clearly what appears to be a heavily sclerotic first sternite such as occurs in some other species and Bedford (ref. cited, p. 846) indicates such a structure as present in the female only of this species. No such sexual difference exists in any species of which I have specimens that permit the definite correlation of the sexes, these including material which seems rather definitely to agree with the male described by Hill. In other respects the female described by Hill seems to agree with the male and it is possible that his figure is in error, the assumption being supported by the fact that his figures are in many cases morphologically very inexact.

The type of *serraticus* is not indicated by Hill. I therefore designate the male as including the holotype.

The species is well marked. The genitalia of the male (Fig. 15*A*) have the basal plate quite large and broadening anteriorly; the preputial sac is beset only with small teeth. The gonapods of the female (Fig. 15*D*) bear two or three tooth-like lobes on the inner face and the margin of the vulva is not at all toothed. In the male the anterior margin of the head is flattened, but not at all emarginate (Fig. 15*B*). The dorsal side of the head shows a faint tendency toward granulation, but there is no such pronounced development of this character as is to be seen in the next species.



TEXT FIGURE 15. — *Trichodectes serraticus* Hill: *A*, genitalia of male; *B*, outline of anterior margin of head of male; *C*, outline of posterior lobe of head; *D*, gonapod and portion of vulvar region of female



TEXT FIGURE 16. — *Trichodectes granulatus* n. sp.: *A*, female; *B*, outline of posterior lobe of head; *C*, markings of intersegmental membrane; *D*, gonapod and portion of vulvar region

Trichodectes granulatus, new species

Text Fig. No. 16

SPECIMEN EXAMINED. A single female from *Procavia adolfi-friederici*, Lulenga, BELGIAN CONGO, March 2, 1927 (J. Bequaert).

Female (Fig. 16*A*). — Length 1.75 mm. A slender species, resembling most closely *T. serraticus* and probably closely related thereto. Head somewhat longer than wide, with the anterior margin continuous and somewhat asymmetrical; posterior lobes strongly produced (Fig. 16*B*) and rather acute; antennae distinctly five-segmented; dorsal surface of the head distinctly granulate.

Thorax cuneiform, the lateral margins of the prothorax and metathorax continuous and quite strongly divergent. Abdomen with pleural plates quite strongly developed on the first three segments, more weakly so on the remainder, the third pair largest. Tergal and sternal plates strongly developed, one on each segment. Intersegmental membranes very distinctly granulate (Fig. 16*C*). Gonapods (Fig. 16*D*) with three tooth-like lobes on the inner face; margin of the vulva distinctly serrate.

NOTES. The asymmetry of the head, while quite marked in the specimen at hand may not be normal. The species is apparently most closely related to *T. serraticus* Hill.

Trichodectes univirgatus Neumann

Text Figs. Nos. 17 and 18

1913. *Trichodectes univirgatus* Neumann, Archives de Parasitologie 15 : 612–614; fig. 6.
1913. *Trichodectes univirgatus* Neumann, Stobbe, Entomologische Rundschau 30 : 112.

Previous Records. From "*Hyrax*" sp., Congo (Neumann) and *Dendrohyrax* sp., Berlin Museum (Stobbe).

Present Record. From *Procavia adolfi-friederici*, Lulenga, Belgian Congo, March 2, 1927 (J. Bequaert).

Notes. The characteristics of this species are so marked that the figures of the head-outline given by Neumann make its determination definite.

I would call attention here to the very marked sexual dimorphism in the form of the prothorax and in the size of the processes of the posterior lobes of the head (Fig. 18*C*). The antennae are quite distinctly four-segmented. The genitalia of the male are marked especially by the series of large, flat teeth which extends the full length of the preputial sac. The gonapods of the female (Fig. 18*B*) are simple and untoothed. Within the abdomen of the female there appears a large, wrinkled sac, probably a modification of the uterus, which is of a rather definite form, as shown in Fig. 18*D*.

The association of this male and female as belonging to the same species seems fairly safe, in spite of the marked dimorphism. Out of all the material examined there seems to be no other species to which either might possibly be referred.

Trichodectes lindfieldi Hill

Text Figs. Nos. 19 and 20

1922. *Trichodectes lindfieldi* Hill, Parasitology 4 : 65–67; pl. 2, figs. 4–6. (As to the male.)
1928. *Trichodectes lindfieldi* Hill, Bedford, Report Director Veterinary Education and Research, Union of South Africa 13–14 : 845.

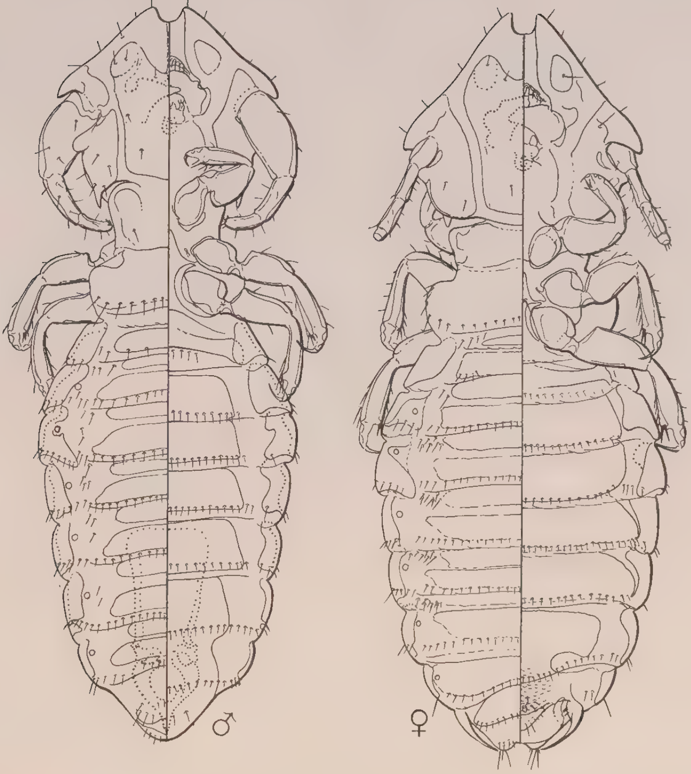
Previous Records. Recorded by Hill from *Procavia capensis*, Mtabamhlopi, Natal.

Present Record. From *Procavia adolfi-friederici*, Lulenga, Belgian Congo, March 2, 1927 (J. Bequaert), and from *Dendrohyrax validus*, Mt. Kilimanjaro (United States National Museum).

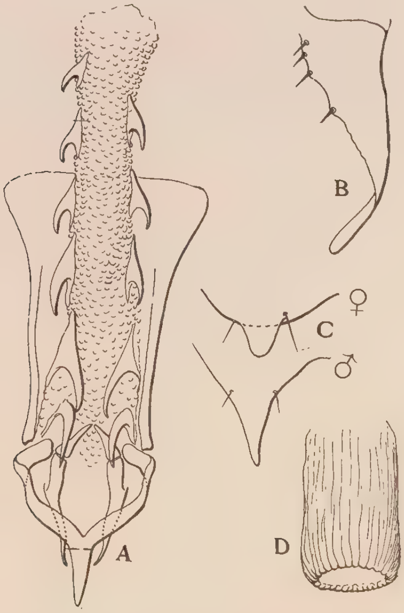
Notes. In the original description of this species Hill has undoubtedly associated the male and female of different species. I here designate the holotype as a male, no original designation having been made. The female belongs to a species which is at hand and which I am identifying as *T. sternatus* Bedford.

The species is well marked by the rather peculiar form of the head, by the apparently entire absence of the pharyngeal sclerite, by the short, but very definite, processes on the posterior lobes of the head, the spinose-serrate claws of the middle and posterior legs, the genitalia of the male and the gonapods of the female.

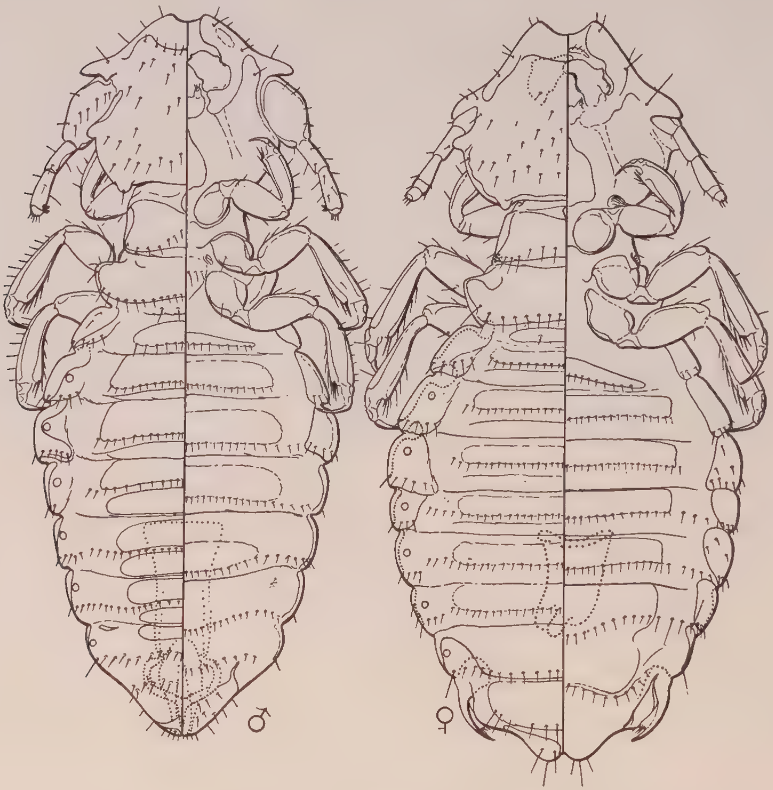
The genitalia of the male (Fig. 20*A*) have the preputial sac beset with a number of large, flat teeth near its posterior end. The female has the gonapods (Fig. 20*H*) beset with a distinct, somewhat fimbriated, lobe on the inner face.



TEXT FIGURE 17. — *Trichodectes univirgatus* Neumann, male and female



TEXT FIGURE 18. — *Trichodectes univirgatus* Neumann: *A*, genitalia of male; *B*, gonapod of female; *C*, outlines of posterior lobe of head of male and female; *D*, internal sac associated with the uterus



Text Figure 19. — *Trichodectes lindfieldi* Hill, male and female

Associated apparently with the uterus is a curious chitinous sac (Fig. 20*G*), which is quite strongly sclerotic and is of a cylindrical form.

This species has a very close relative in the next to be described.

Trichodectes dendrohyracis, new species

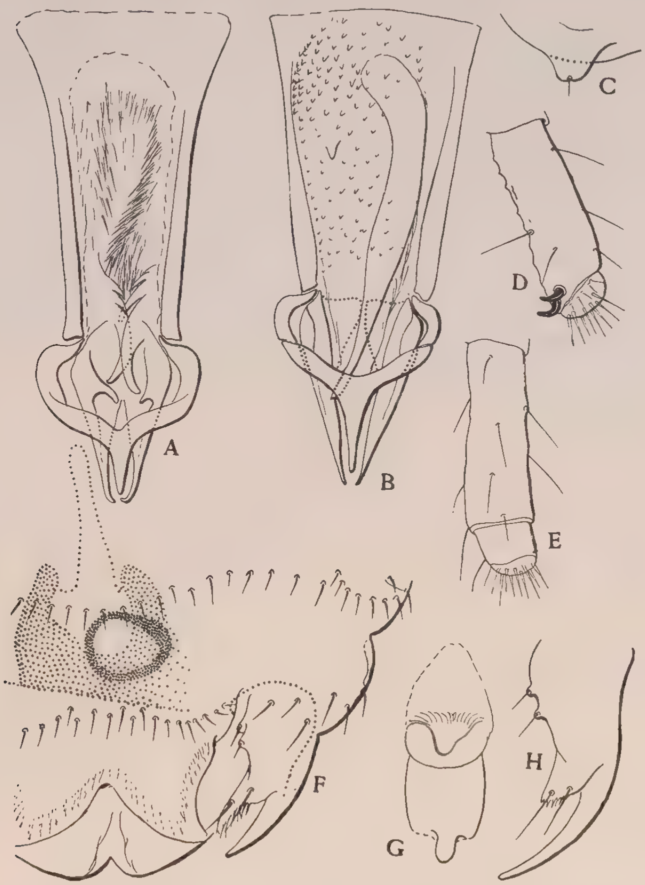
Text Fig. No. 20

Material Examined. Three males and three females from *Dendrohyrax validus*, Mt. Kilimanjaro (United States National Museum). Holotype a male.

Male. — Length 1 mm. In general so closely related to *T. lindfieldi* (as here understood) that the general figure of the latter will do for this. The distinctive features appear in the genitalia (Fig. 20*B*) which lack the large teeth on the preputial sac and which have the penis developed into a conspicuous, sclerotic tube.

Female. — Length 1 mm. Practically identical with the female of *T. lindfieldi* except that associated with the uterus is a sac, or other structure (Fig. 20*F*) of curious and apparently constant form, which replaces the cylindrical sac found in *T. lindfieldi*.

Notes. Although this species is certainly very close to *T. lindfieldi*, I am convinced that the two must be recognized as distinct. The association of the male and female here regarded as *dendrohyracis* is on the basis of their occurrence together and their size.



Text Figure 20. — *Trichodectes lindfieldi* Hill: *A*, genitalia of male; *C*, outline of posterior lobe of head; *D*, apex of antenna of male; *E*, apex of antenna of female; *G*, internal sac associated with uterus; *H*, gonapod. *Trichodectes dendrohyracis* n. sp.: *B*, genitalia of male; *F*, internal sac associated with the uterus

Trichodectes oculatus Bedford

1928. *Trichodectes oculatus* Bedford, Report Director Veterinary Education, Union of South Africa 13–14 : 847; pl. 4, f. 10, pl. 6, f. 14.

Previous Records. Described from a single male from *Heterohyrax ruddi*, Zoutpansberg District, Northern Transvaal.

Notes. This species is evidently very similar to that described above as *T. dendrohyracis*, the genitalia of the males apparently being practically identical. However, *T. oculatus* is described and figured as having the posterior margin of the head straight, which is certainly not the case with *T. dendrohyracis*.

Trichodectes sternatus Bedford

Text Figs. Nos. 21 and 22

1928. *Trichodectes sternatus* Bedford, Report Director Veterinary Education and Research, Union of South Africa 13–14 : 845; pl. 4, f. 9, pl. 5, f. 12.

Previous Records. Originally described from *Procavia capensis natalensis*, Mtabamhlopi, Natal, "along with specimens of *T. lindfieldi* Hill and *T. serraticus* Hill."

Material Examined. Numerous males and females from *Procavia adolfi-friederici*, Lulenga, Belgian Congo, March 2, 1927 (J. Bequaert); two males from *Heterohyrax brucei bakeri*, Nimule, Uganda; a male and a female from *Procavia capensis* without indication of locality; the two last records being from the United States National Museum.

Notes. This determination is dubious. In the original description of *T. sternatus* it is compared with *T. lindfieldi* Hill. But, as already shown, *T. lindfieldi* was based upon the male of one species and the female of another, an error not detected by Bedford. In the material at hand, males having genitalia which agree with the figure given by Bedford for the male of *T. sternatus* seem certainly to belong with females that are apparently the same as the supposed female of *T. lindfieldi*.

On the other hand, in the same paper Bedford described as new a *T. emarginatus* and as far as his figures and description are concerned the specimens at hand might equally well be referred to this. I have referred them to *T. sternatus* as it is figured in somewhat more detail and has page precedence.

The accompanying figures will aid in placing the species. The genitalia of the male (Fig. 22*A*) are of a distinctive type, the pseudopenis — or what is apparently the pseudopenis — being represented only by the bases of its arms; preputial sac without large teeth. The gonapods of the female (Fig. 22*B*) are simple. There is no evident internal sac associated with the uterus, such as appears in the females of some other species. The antennae of both male and female are apparently but three-segmented in both sexes.

The specimens at hand agree closely in structure, but vary greatly in size. The specimens from Lulenga are about 1.5 mm. long. The two specimens from *Procavia capensis* are larger, reaching 1.8, while those of *Heterohyrax brucei* are smaller, reaching but 1 mm.

Trichodectes emarginatus Bedford

1928. *Trichodectes emarginatus* Bedford, Report Director Veterinary Education and Research, Union of South Africa 13–14: 845; pl. 2, f. 5.

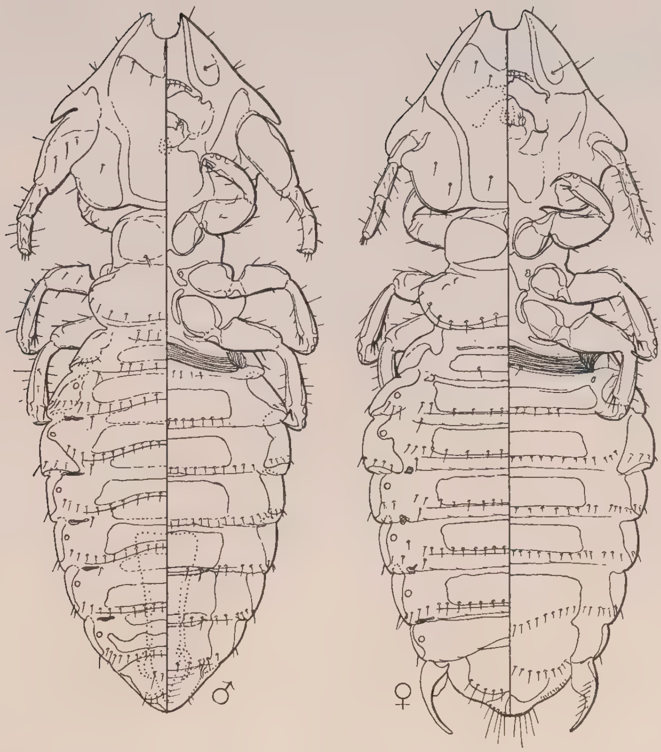
Previous Records. Originally described from a single male from *Heterohyrax ruddi*, Zoutpansberg district, Northern Transvaal.

Notes. As indicated above, it is not apparent from the literature why this species is distinct from *T. sternatus* Bedford.

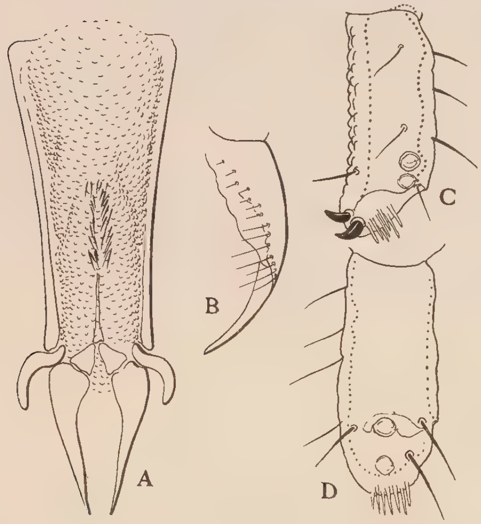
Trichodectes congoensis, new species

Text Figs. Nos. 23 and 24

Material Examined. Holotype, a male, and allotype and several paratypes from *Procavia adolfi-friederici*, Lulenga, Belgian Congo, March 2, 1927 (J. Bequaert), and two similar females from *Dendrohyrax validus*, Mt. Kilimanjaro (United States National Museum).

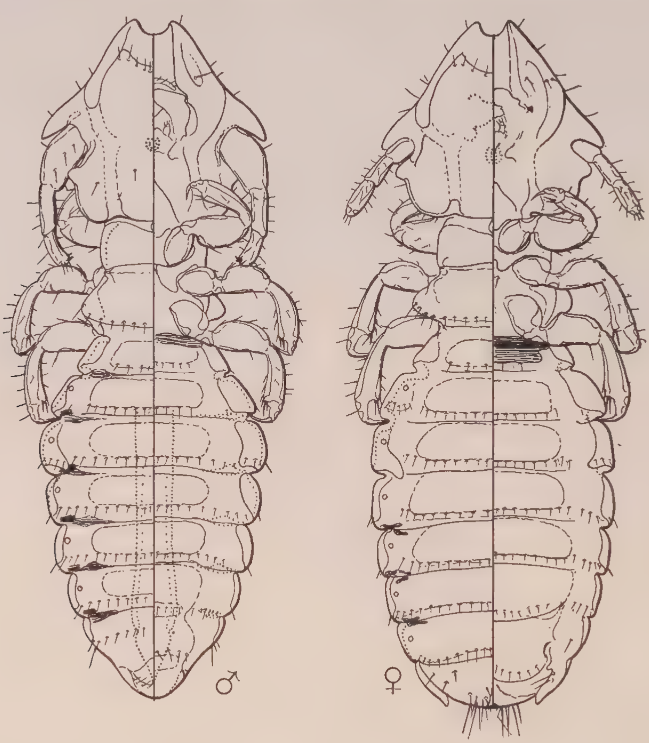


Text Figure 21. — *Trichodectes sternatus* Bedford, male and female



Text Figure 22. — *Trichodectes sternatus* Bedford: *A*, genitalia of male; *B*, gonapod; *C*, apex of antenna of male; *D*, apex of antenna of female

Male (Fig. 23). Length 1.1 mm. Head quite acute anteriorly and with a distinct median notch; without even traces of processes on the posterior lobes; pharyngeal sclerite present; longitudinal bands indistinct. Prothorax quadrate. Metathorax with the sides strongly divergent. Abdomen with the first three pleurites more strongly developed than the others, the third largest and lobed dorsally and ventrally. Tergites and sternites with but a single plate. The intersegmental furrows, dorsally, are marked by quite conspicuous, small sclerotic areas which are quite characteristic of the species.



Text Figure 23. — *Trichodectes congoensis* n. sp., male and female

Genitalia (Fig. 24*D*) with the basal plate long and slender, reaching almost to the base of the abdomen; pseudopenis articulating by the tips of its arms to the arms of the basal plate; preputial sac indistinct and beset with very minute teeth.

Female (Fig. 23). Length 1.2 mm. In form of head and thorax, except for the antennae, very similar to the male. Abdomen with the tergites and sternites undivided. The intersegmental sclerotic areas, which are conspicuous in the male, are much reduced. Gonapods (Fig. 24*B*) with a small, two-toothed lobe on the inner face.

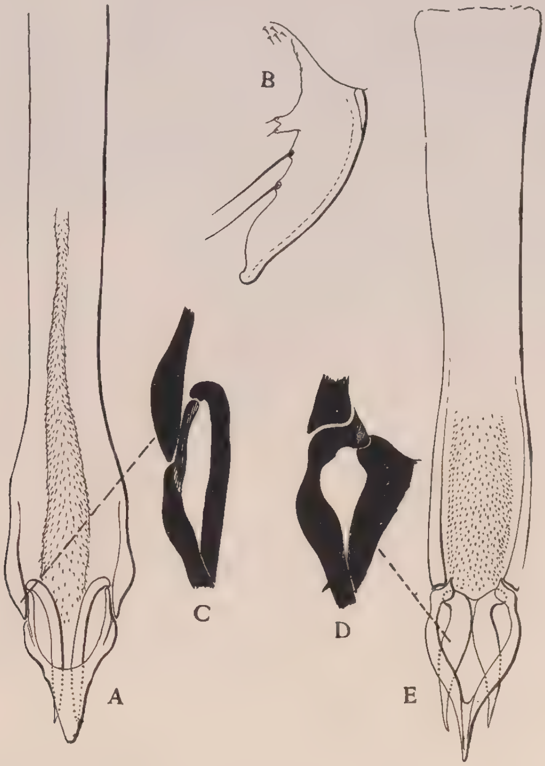
Notes. I cannot place this species with any described form. It is approached very closely by the following.

Trichodectes baculatus, new species

Text Fig. No. 24

Specimens Examined. Four males from *Dendrohyrax validus*, Mt. Kilimanjaro (United States National Museum). These were accompanied by two females recorded under the previous species and the status of which is doubtful.

Male. Differing from the male of *T. congoensis* apparently only in the character of the genitalia (Fig. 24*A*). In this species the arms of the basal plate articulate with the sides of the arms of the pseudopenis and the endomeres are completely divided (Fig. 24*C*). The basal plate is even longer than in *T. congoensis,* extending actually into the metathorax.



Text Figure 24. — *Trichodectes congoensis* n. sp.: *B*, gonapod; *D*. detail of genitalia of male; *E*, genitalia of male. *Trichodectes baculatus* n. sp.: *A*, genitalia of male (only part of basal plate shown); *C*, detail of genitalia of male

Notes. In view of the very close evident relationship of this form with *T. congoensis*, it is possible that the two females mentioned may belong with these males. But it is impossible to tell. If they do the females of the two species can hardly be distinguished. Further collecting may throw some light on the matter. As far as the male is concerned, they must be regarded as distinct.

Trichodectes robertsi Bedford

1928. *Trichodectes robertsi* Bedford, Report Director Veterinary Education, Union of South Africa 13–14 : 846–847; pl. 1, f. 2.

Previous Records. Known only from a single male from *Heterohyrax ruddi,* Zoutpansberg District, Transvaal.

Notes. Apparently this species is not present in the material at hand. It belongs to the group in which there is no median notch in the front of the head.

Trichodectes neumanni Stobbe

1913. *Trichodectes univirgatus* var. *neumanni* Stobbe, Entomologische Rundschau 30 : 112.

Previous Records. Recorded by Stobbe from *Dendrohyrax* sp. in the Berlin Museum, without indication of locality.

Notes. The description of this consists merely of the statement that it differs from *T. univirgatus* in the absence of the processes on the posterior lobes of the head. As on this basis it might well be any one of several species it must stand as unrecognizable until the types have been re-examined.

B. A MALLOPHAGAN FROM A VIVERRID

Eight or more species of Trichodectidae have been recorded from the family Viverridae and still others are present in the material that is at hand. Thus far, however, there is no evidence of the occurrence of two or more species upon a single host such as has just been described for the Procaviidae. Practically all the species that have been named are very poorly described, the essential features being in almost every case entirely ignored. It is consequently a dubious matter to identify anything with a named form. The material sent me by Dr. Bequaert contains a single species from a viverrid which I am thus doubtfully referring to a named species.

I would here note that all the species of Trichodectidae from viverrids that I have seen agree in possessing but three pairs of abdominal spiracles. This character may perhaps be used to define a generic group when the family has finally been reviewed.

Trichodectes rammei Stobbe

Previous Records. Known only from the original description, from *Herpestes galera*, Amani, German East Africa, in the Berlin Museum.

Present Record. Numerous specimens of what is possibly this species from *Galerella brunneo-ochracea* Matschie, Ruchuru, Belgian Congo, February 22, 1927 (J. Bequaert).

ANOPLURA

HAEMATOPINIDAE

Polyplax calva Waterston

Previous Records. Recorded by Waterston and by Ferris from various subspecies of *Cricetomys gambianus* in Zanzibar and from numerous localities in Africa.

Present Record. From *Cricetomys gambianus osgoodi*, Uluguru Mts., Tanganyika Territory, October 1926 (A. Loveridge).

Hoplopleura enormis pelomydis Ferris

Previous Records. From species of *Pelomys* and *Lemniscomys* from various localities in Africa.

Present Record. From *Pelomys fallax fallax*, Uluguru Mts., Tanganyika Territory, October 15, 1926 (A. Loveridge).

ODONATA COLLECTED IN LIBERIA AND THE BELGIAN CONGO

By Philip P. Calvert, Zoölogical Laboratory, University of Pennsylvania, Philadelphia

Sapho ciliata (Fabricius)

One male, Bakratown, Liberia, October 1926, agrees with the description by de Selys in the Monog. Calop., 1854, p. 60, of the "plus jeunes" males, as it has the wings entirely hyaline. Front wings 34.5 mm. long, max. width 10 mm. (at the fifth postnodal cross-vein). Hind wing 34.5 mm. long, max. width 11 mm. (at the fifth postnodal cross-vein). The last three abdominal segments have been lost.

Libellago dispar (Beauvois)

One female, Du River, Camp No. 3, Liberia, agrees better with the description of the female of this species, as given by de Selys in the Monographie des Caloptérygines (1854, p. 227) than with any other by him or by later authors. The differences from that description are as follows: Hind wing 22 mm. The transverse yellow ray on the labrum is divided into two at the middle, distal half of the labium black. Above the yellow humeral stripe is a detached, cuneiform, yellow spot, its wider end superior. There is a narrow, mid-dorsal stripe on abdominal segment 7, a pair of dorsal spots at the hind end of segments 8–10 and an inferior lateral spot on 10, all probably yellowish in life. The abdominal appendages are 2.4 times as long as segment 10. Inferior surfaces of femora and tibiae slightly pruinose (the second legs have been lost). 18–19 postnodals on the front wings, 16–17 on the hind wings.

Ceriagrion glabrum (Burmeister)

Two males and one female, Monrovia, Liberia. Abdomen ♂ 30 mm., ♀ 33 mm.; hind wing ♂ 19.5 mm., ♀ 22 mm. Dr. Ris has published two figures of the apex of the abdomen of the male of this species in his useful paper on the Odonata of South Africa (Annals S. Afr. Mus., XVIII, p. 315, 1922).

Disparoneura vittata Selys

One male, Bakratown, Liberia, October 1926. The pale (blue?) antehumeral stripe has a maximum width of .75 mm. and a maximum length of 2 mm., reaches upward to .7 of the length of the mesepisternum and is unequally bifid at its upper end, the outer (or lateral) division longer than the inner, both of them very acutely pointed. The third abdominal segment has a very small (.1 mm.) pale spot on each side of the dorsum at its anterior end.

Tetrathemis camerunensis (Sjöstedt)

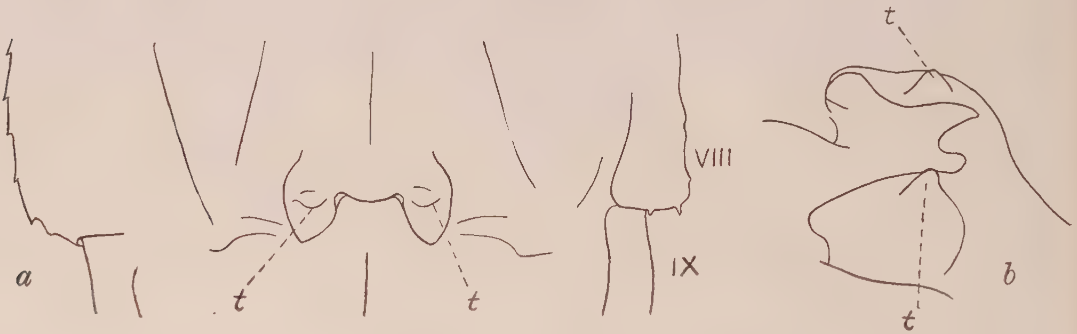
Neophlebia camerunensis Sjöstedt, 1899, Bihang K. Svenska Vet.-Akad. Handlingar, XXV, Af. IV, No. 2, p. 36.

One male, Du River, Liberia, Camp No. 3, August 3, 1926. Differs from the original description (*loc. cit.*) in having the inferior surface of the fore femora orange for the proximal half, the black on the sides of the thorax, especially on the metepimeron, with a dark metallic green reflection.

Only on the right hind wing is the arculus at the second antenodal; on the other three it is placed at a varying distance (.1–.16 mm.) proximal to the arculus and hence does not fall in the key given by Dr. Ris (Catal. Coll. Selys, Libell., p. 45, 1909).

Orthetrum microstigma Ris

Two females from Gbanga, Liberia, taken by Dr. Joseph Bequaert, numbered two and three by him, and on which he found Ceratopogonine midges, as stated by him elsewhere in this report (p. 846), appear to belong to *Orthetrum microstigma* Ris. As the vulvar lamina in none of the specimens described by Dr. Ris was "ganz deutlich zu sehen" and as these Gbanga females differ in some respects from the description (Revue Zool. Afric., I, 1, p. 129, 1911; reproduced in Catal. Colls. Zool. Selys, Libell. p. 1088, 1916), the differences are set down here. Both females were preserved in alcohol.



TEXT FIGURE 25. — Vulvar lamina of *Orthetrum microstigma* Ris: *a*, ventral view; *b*, oblique view, ventrally

Female No. 2 (Bequaert). Labium pale olive brown, median lobe blackish, mesal (really distal) margin of lateral lobes for their proximal half, and for almost equal width, dark brown. Face olive, paler on clypeus and still paler on labrum; no indication of orange on the frons and only an extremely fine black line visible on the sides of the latter (= genae) in front of the eyes, but not visible in front of the median ocellus. Vertex colored like the frons, its apex divided into two obtusely-pointed lobes, when viewed from in front.

The most elevated part alone of the mid-dorsal thoracic carina blackish, with no dark margins. A narrow (.33 mm.) ante-humeral, reddish brown stripe on the lower four-fifths only of the mesepisternum. A subparallel, slightly wider but less defined stripe on the humeral suture. A sharper and blacker stripe, .33 mm. wide, on the lower half of the mesepimeron, separated from the metastigma by about the width of the stripe itself; a trace of a similar stripe, about .75 mm. long, above the metastigma, on the metepisternum. Latero-ventral metepimeral carina sharply black; a dark streak on the posterior surface of each third coxa, otherwise no dark ventral markings on the thorax.

Vulvar lamina well displayed, bilobed, interval between the lobes about .33 mm., as compared with .25 mm., the width of each lobe at its base, forming an obtuse angle at each side (right and left), the middle of this interval a little convex and bent slightly dorsad; the two lobes diverging from each other at a little more than 90° in their distal halves, each lobe about .28 mm. long, narrowing to a rounded apex, and bearing on its ventral surface a subbasal, transverse ridge or tubercle (Fig. 25).

Colors of the abdomen not well defined, apparently similar to Dr. Ris' description.

Wings "ziemlich dunkel grau braun beraucht," yellow at the base not well defined, usually paler in the middle of each cell; in the front wings reaching to slightly beyond the second antenodal and the arculus, in the hind wings to the fourth antenodal, triangle and also below the distal side of the triangle and thence to the anal angle. Costal margin of pterostigma, on front wings, 2.7 mm., on hind wings 2.8 mm. 13 antenodals on the front wings; 2 rows Rs-Rspl and 1 row M4–M4spl on all wings; triangle of both hind wings with one cross-vein.

Abdomen, 24; width at segment 3, 3.7; at segment 8, 3.7; hind wing, 30 mm.

Female No. 3 (Bequaert). Similar to No. 2, but the dark brown on the mesal margin of the lateral labial lobes extends distad for more than one half the length thereof. Face browner, a dark brown spot on the center of the labrum but not reaching any margin thereof; each side of the frons superiorly a little reddish, a mere trace of the black line in front of the eyes and nothing of it on the upper surface of the frons.

Thoracic markings as described for No. 2 above, the metepisternal stripe above the metastigma longer (1.33 mm.), the posterior margin of the metasternum narrowly blackish, the black of each latero-ventral metepimeral carina prolonged slightly in dark brown at its anterior end onto the metasternum.

Distal halves of the femora and the whole flexor surfaces of the tibiae blackish.

Lobes of the vulvar lamina bent more dorsad and apparently somewhat retracted cephalad and hence not so readily visible.

Colors of abdomen better preserved, being more of a pale olive than "trüb rotbraun," all carinae, hind margins of 3–7 and most of the dorsal surfaces of 8–10 black; in addition, 3 and 4 have a longitudinal brown stripe on each side of the dorsum midway between the mid-dorsal and lateral carinae.

Wings much less (but still slightly) smoky; yellow at the bases paler than in No. 2, ill-defined, on the front wings reaching to the first antenodal and the cubital cross-vein, on the hind wings to the second antenodal and the arculus, and caudad for 2–3 cells beyond the membranule. Costal margin of pterostigma, front and hind wings, 2.8 mm., 13 antenodals on the front wings; 2 rows Rs-Rspl, 1 row M4–M4spl, all wings; triangle of hind wings free.

Abdomen, 26; width at segment 3, 3.27; at segment 8, 2.86; hind wing, 30.5 mm.

Tholymis tillarga (Fabricius)

One female, Du River, Camp No. 3, Liberia, July 24, 1926.

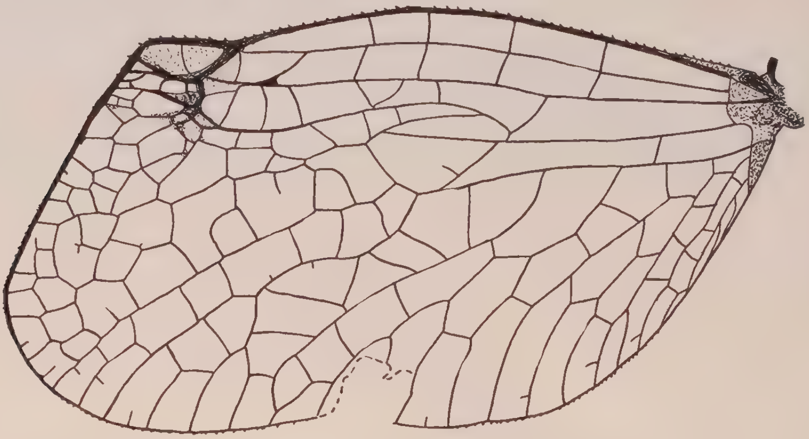
Palpopleura lucia (Drury)

Three specimens, Du River, Camp No. 3, Liberia, July 1926, as follows: one male *lucia* type form male of Ris, Cat. Coll. Selys, Libell., p. 321, approaching pl. I, fig. 1 (Cameroon); one male var. *portia* Drury, Ris, p. 321, nearest pl. I, fig. 7 (Nossibé); one female Ris, p. 322, nearest pl. I, fig. 11 (Cameroon).

Acisoma panorpoides ascalaphoides (Rambur)

Ris, 1911, Cat. Coll. Selys, Libell., p. 458; 1919, *loc. cit.*, p. 1152.

One female, Monrovia, Liberia, abdomen 17 mm., right hind wing 20 mm., pterostigma of front wing 2.5 mm. The dark brown anastomosing stripes on the thorax are distinct. The left hind wing (Fig. 26) is malformed from slightly beyond the arculus, its length along the costal margin 9.5 mm.; beyond the abnormal nodus, it is truncated caudad and distad, the posterior caudal angle rounded, triangle 4-sided by reason of the anterior and distal sides not meeting each other but each of them ending on the lower sector of the arculus (or 6-sided, if one considers the broken proximal and distal sides); rudiment of a cross-vein projecting into the triangle from its proximal side, which latter lies a little distad of the arculus; the two sectors of the triangle nearly normal, but all the venation anterior to them and distad of the triangle abnormal and irregular. Our figure, drawn by camera lucida and believed to be correct for each cell and veinlet, may be compared with Dr. Ris' figure 290, *loc. cit.*, p. 455, of the normal venation of this genus.



Text Figure 26. — *Acisoma panorpoides ascalaphoides* (Rambur), female, Monrovia, Liberia. Malformed left hind wing

Apparently the only other West African records for this subspecies are those from Portuguese Guinea by Martin (Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 655, 1908) and from Bukama, Belgian Congo, one female, also collected by Dr. Bequaert (Ris, *loc. cit.*, p. 1152).

Trithemis africana (Brauer)

Ris, 1912, Catal. Coll. Selys, Libell., p. 780, figs. 444 (wings), 445 (genit. male).

One male, Lulonga, Belgian Congo, December 21, 1926.

Only two specimens of this species, both males, have thus far been mentioned in the literature, the type from Sierra Leone, the other from near Bolobo, Belgian Congo. Both of them lack the last three abdominal segments, the type also the sixth and seventh. The following notes are, therefore, given from the present example.

Prothorax chiefly brownish yellow, a transverse blackish brown stripe on each side of the middle lobe, posterior prolongation of the hind lobe only one-third as wide as the middle lobe, convex on its hind margin. Thorax as described by Ris for the Bolobo male, but the blackish brown stripe at the metastigma is fused for a very short distance with the posterior branch of the fork of the humeral stripe on the right (although not on the left) side of the thorax. The genital hamule is not as slender and the genital lobe is much less pointed at the apex than in the figure of these parts of the type, given by Ris; he mentions a similar shape for the genital lobe of the Bolobo male. Abdominal segments 6–10 are blackish brown; 6 and 7 have an elongate, ellipsoidal, tawny yellow spot on each side of the dorsum, and a similar, but longer, spot on each side of the venter; the ventral surface of 8 is colored similarly to that of 7; there is a less distinct, elongate, tawny spot on each side of 9 inferiorly.

Superior appendages 1.72 mm. long, slightly shorter than the combined length of segments 9 and 10 (2 mm.), slender and sub-cylindrical in the proximal third, gradually thickening, especially on the under side, in the second third, thence gradually tapering to an acute apex; there is a row of about five denticles on the inferior surface, in the third fourth of the appendage's length, the last denticle distinctly larger than the others on the right appendage, but not on the left.

Inferior appendage a very little shorter than the superiors; viewed from below, about .65 mm. wide at base, thence gradually narrowing to the truncated apex, which is about .2 mm. wide; in profile view, the apex is curved upward and ends in two denticles. (The hind end of the abdomen has been obliquely compressed and distorted, hence the absence of figures here.)

All four wings distinctly pale yellow from base to stigma between the costa and the principal sector (M_1), remainder of the wings pale smoky brown, more pronounced on the front wings from base to triangle inclusive, behind the submedian vein (Cu), especially in the centers of the cells and above all in the entire length of the submedian space (cu), which last is a fairly dark brown. Hind wings dark brown for their entire width from base to fifth antenodal and distal end of the triangle, and to slightly beyond this level in the post-triangular (discoidal) area and in the anal loop, and along the hind margin as a narrow band to the end of the first sector of the triangle (Cu1); many, but not all, of the cells in the anal area in general are paler in their centers. In the coloring of the wings also, therefore, this Lulonga male is more like that from Bolobo. Front wings with three rows of post-triangular cells to the level of the point of separation of the principal (M_1) and median (M_3) sectors, thence followed by four rows.

Abdomen 29 mm.; hind wing 35 mm.; stigma of front wing (costal margin) 3.6 mm.

Trithemis nuptialis Karsch

Ris, 1912, Cat. Coll. Selys, Libell., p. 787, fig. 449 (genit. male).

One male, Monrovia, Liberia, abdomen 27 mm., hind wing 29 mm., pterostigma barely 3 mm., has the frons and vertex metallic violet, no pruinosity on thorax or abdomen; abdomen black, segments 2 and 3 with yellowish marks on the sides and inferiorly, 4 and 5 unspotted, 6 and 7 with a narrow, longitudinal, yellow stripe on each side of dorsum, reaching neither base nor apex of the segments; wings uncolored, excepting the apices of all very narrowly brownish and a very minute yellowish tinge in the submedian space (cu) of the hind wings, from wing-base to the level of only one-half of the first juxtamembranular cell and not bordering the membranule. Front wings with 11 antenodals, 9–10 postnodals, hind wings with 7–8 and 10–11 respectively. The genital lobe of abdominal segment 2 is more like that of *T. dichroa*, as figured by Ris (*loc. cit.*, p. 796), than his figure of *nuptialis*, in that the apical half is more slender and its hind margin crenulate, while the hamule also resembles his figure of *dichroa* in its straighter anterior margin and more widely opened inner branch. In both of these structures, however, this male approaches the original figure of the genitalia of *nuptialis* published by Karsch in 1894 (Berl. Ent. Zeitschr., XXXIX, p. 13).

One female, Du River, Camp No. 3, Liberia, probably belongs to this species, but requires some discussion. Dr. Ris (*loc. cit.*) says of the female of *nuptialis*: "Von *stictica* kaum zu unterscheiden und von uns im ganzen nach der Herkunft der einen oder andern Form zugeteilt." His description of *stictica* gives its

"Unterlippe hellgelb; Oberlippe gelb, in der Mitte schmal bis ziemlich breit schwarz. . . . Stirn gelb mit breiter, schwarzer, blaumetallischer Basislinie. Scheitelblase gelb." In all of these parts the present female differs, but agrees with Ris' description of *nuptialis,* male, *viz.:* "Unterlippe in der Mitte schwarz, die Seiten ziemlich breit bis sehr schmal gelb. Oberlippe schwarz. . . . Stirn und Scheitelblase glänzend blauviolett." It does, however, agree with Ris' description of the thorax and abdomen of *stictica* female. The wings are almost colorless except for a diffuse pale brown edging at the apices and a mere trace of yellow at the bases, which, on the hind pair, does not reach even halfway to the submedian cross-vein (cuq) and is much smaller on the front pair. Abdomen, 24 mm.; hind wing, 29 mm.; stigma of front wing, costal margin, 3.27 mm.

Trithemis arteriosa (Burmeister)

One male, Gbanga, Liberia, September 1926. Midges of the subfamily Ceratopogoninae were found by Dr. J. Bequaert attached to the wings of this specimen. (See page 846.)

A widely distributed species throughout Africa, from Algeria to Natal, also known from Syria, the Canary Islands, Socotra, and the Comoro Islands.

NEUROPTEROUS INSECTS

By Nathan Banks, Museum of Comparative Zoölogy, Cambridge, Mass.

NEUROPTERA

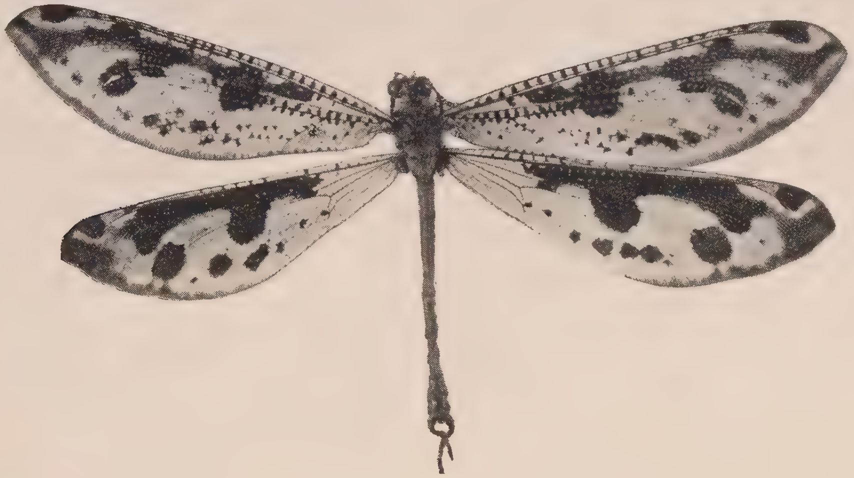
MYRMELEONIDAE

Palpares manicatus Rambur

Two females and two males from Banga, Liberia, 21 October, Moala, Liberia, and Kolobanu, Liberia, 19 October.

Palpares manicatus var. **connexus,** new variety

This specimen (Fig. 27) agrees with *manicatus* in genitalia, in marks of body and legs, length of palpi, etc. It differs strikingly from every form I have seen or that has been figured in that in both fore and hind wings there is a longitudinal streak through the wing connecting the spots to the tip; these spots are fairly normal. In the fore wing the streak is not so broad (about twice the costal area) but begins at the basal spot, through the median to the pterostigmal and out to tip. In the hind wing the streak is broad and heavy (three to five times costal area); starting from basal spot above the cubital fork it runs out just behind the radius to apical mark. In the fore wing the pterostigmal spots are united, in the hind wings they are separated, the hind one nearly round; there are two or three small spots behind the median spot, and several small points toward the base.



Text Figure 27. — *Palpares manicatus* var. *connexus* Banks. Male, holotype

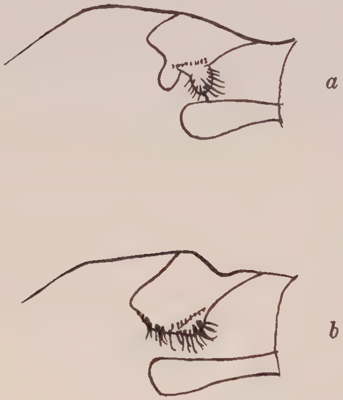
One male from Bomboma near Moala, Liberia (J. Bequaert).

Palpares tigris Dalman and **P. manicatus** Rambur

These two names have been considered by me and also by Petersen as one, with four Navasian names and *hamatus* as synonyms. I have also included *sylphis*.

However, it is quite possible that there are two species. In *tigris* (with *hamatus* and *sylphis*) there is a black band (or three spots) below the antennae; in *manicatus* no band; in *tigris* the basal spot of hind wing is large, in *manicatus* smaller or nearly absent; the last joint of palpus seems to be longer in *tigris* than in *manicatus*.

But the difference, which if constant is conclusive, is in the male genitalia. I have before me three male *manicatus* and five male *tigris;* the long superior appendages appear to be the same in both, both with the same recurved process toward base; the ventral plate also appears to be the same, possibly a little longer in *tigris;* but between these two is a short bent process with a bristly head: in all the *tigris* the tip of this process is entire and evenly truncate, in all of the *manicatus* the tip is bifid, the basal lobe bristly, the posterior lobe smooth; the figures (Fig. 28) show the difference. It is barely possible that this smooth lobe seen in *manicatus* is an extensile process extruded, but inasmuch as the two series are constant I am inclined to believe it is a constant difference.



Text Figure 28. — Male genitalia in profile of *Palpares manicatus* (Rambur) (*a*) and *P. tigris* (Dalman) (*b*), showing difference in the shape of the process between the superior appendages and the ventral plate

Centroclisis minor, new species

Black, head, thorax, coxae, femora and extreme base of abdomen densely clothed with long white hair; rest of abdomen with very short white hair; antennae and outer sides of tibiae rather rufous. Vertex with a transverse row of four elevated scars, the lateral ones much the larger; the pronotum short and broad as usual, each side with a broad, pale stripe. Wings unmarked; venation dark, much spotted with pale, in places with pale streaks; the cubitus out to the fork and the basal part of the fork almost wholly pale, the branches therefrom also mostly pale; in fore wings eight cross-veins before the radial sector, in hind wings seven; about seven branches to radial sector in each wing; posterior banksian line indicated; apical field with one series of a few (two to six) cross-veins; in hind wings the first anal runs into the cubital fork at basal third of latter; in fore wings four branches of the first anal to margin, in hind wings three such branches; the costals in both wings are entirely simple.

Length of fore wing — 35 mm., breadth, 8 mm. Length of hind wing — 32 mm., breadth 7 mm.

From Nairobi, Kenya Colony, April (J. Bequaert).

The genus *Centroclisis* (including *Neoclisis*) if restricted to species with entirely simple costals has few species: from Egypt, *cervina* Gerstaecker, *adnixa* Navás, and *lineata* Navás (probably all one species); *lanosa* Navás from Madagascar; and *punctulata* Navás from Africa. The latter species differs in spotted wings, while the others are much larger than *minor*.

Cueta mysteriosa (Gerstaecker)

One from Mombasa, 3 May.

ASCALAPHIDAE

Helicomitus festivus (Rambur)

One from Du River, Camp No. 3, Liberia.

Suphalomitus argyropterus (Taschenberg)

One from Bomboma near Moala, Liberia, 31 October.

CHRYSOPIDAE

Chrysopa oralis Navás

On board ship, off Cabo Verde, night July 3–4, two specimens.

Chrysopa decolor Navás

On board ship, off Cabo Verde, night July 3–4, nine specimens.

Chrysopa nimbosa Banks

On board ship, off Cabo Verde, night July 3–4, one specimen.

Ankylopteryx tristicta Navás

On board ship, off Cabo Verde, night July 3–4, one specimen.

MECOPTERA

PANORPIDAE

Bittacus montanus van der Weele

One from Ruchuru, Belgian Congo, April.

TRICHOPTERA

HYDROPSYCHIDAE

Polymorphanisus bipunctatus (Brauer)

Two from Barumbu, Belgian Congo, 6 January.

XXXVII

PHOTOGRAPHY

By Loring Whitman

In writing about photography in the tropics, one must remember that conditions vary so much from place to place that what is applicable to one part of the world may not be so to another, even though the localities may be equidistant from the equator. Heat, humidity, the character of the landscape, water supply and other environmental conditions must be considered in the region in which one is anxious to engage in photography. What experience I have had has been entirely limited to Central Africa and to such a region only is it applicable.

Before going further I wish to thank Mr. George Mallinkrodt, to whom we are greatly indebted for his generous contribution to the Expedition, in the form of the large bulk of the photographic chemicals which we took with us for developing films in the field. Not only were these donated to us, but they were packed in loads of roughly sixty pounds each so that they could be taken directly on safari without repacking. The quality of the materials needs no advertising.

The first question is with regard to the cameras necessary to get pictures. I have little to say on this point for I find that each photographer has his own hobbies when it comes to cameras, lenses and other similar equipment. I, myself, was quite partial to my own graflex which had already given me five years' excellent service and so relied chiefly on that. It was a 4″ × 5″ size, revolving back telescopic model with a Bausch and Lomb Tessar 1 c. f 4.5 lens. In addition I had a Dallon telephoto lens working at f 5.6 with an equivalent focal length of seventeen inches. I found that for practically all purposes this was entirely satisfactory. The disadvantage of such an outfit, however, must not be overlooked. In the first place the camera, size 4″ × 5″, is an American one, and hence it is very difficult to buy film for it in any place outside of the United States. Secondly, it is quite bulky to carry. Thirdly, when it is hot and steamy and the operator is perspiring freely the ground glass focusing panel becomes coated with moisture and distorts the focus. Fortunately I discovered this early in the trip and was able to make allowances for it. The advantages, on the other hand, are visual evidence as to what the picture is to be like; accurate focusing quickly especially when dealing with animals; and a large enough plate to make contact prints worth while. However, in case one has no intention of making animal pictures a feature, I think I would recommend a folding camera on the order of the Zeiss with a double extension bellows and a ground glass focusing panel. The best size for universal work is 9 × 12 cms. for this is popular throughout the world and films can easily be procured at any civilized post. This type of camera has the advantage of portability and, with the ground glass, accuracy of focus. The double extension bellows further allows, either for long focus lenses or for close-up pictures of small objects or details. I have found it to be a very valuable machine, although I did not have one myself at the time. So much for still pictures.

Besides our still pictures we hoped to get some valuable "movies" of the country and its people. For this I took an "Eyemo" put out by the Bell and Howell Company. I selected this on account of its apparent ruggedness, compactness and relative inexpensiveness. I may state here, that if one expects to make moving pictures a feature, it will be wiser to get a more expensive outfit which will give greater latitude. Not having had experience myself with such outfits I cannot justifiably advise further. However, I found the Eyemo to be very satisfactory throughout the trip.

Concerning taking extra cameras, I am in a mixed mind. I took one myself — a 4 × 5 plate camera — but before half the trip was over, it had become so rusted and mildewed that I sent it home entirely out of commission, whereas the graflex being used daily, never "missed fire" during the entire trip. The reason for this was that the constant use kept it from corroding and rusting. It was always wiped after getting wet. It was aired and cleaned on every opportunity. The reserve outfit on the other hand was in a "water proof" trunk and because it was not being used was neglected. I never missed it after it was sent away.

A tripod will be necessary but the variety can be suited to the individual's taste. In case one is using a wooden tripod, remember that the joints will swell in the rainy season. I found that this could be counteracted by shaving the legs down until they didn't jam. I also found that the three-ply head came unglued — but again, a supply of brass screws remedied the defect and the tripod is still doing me good service. I might state here that perhaps the best way of considering equipment is to examine each part of the outfit in the light of to what it is going to be subjected. How is it to be repaired? Then take the things necessary to repair it, for there is no foolproof outfit devised for the tropics, and in so far as you are out of touch with further supplies it is wise to be self-sufficient. For this reason I took adhesive plaster, assorted brass screws from the smallest size up, and ambroid, a form of glue which "sets" in moisture. This latter material I have found to be invaluable. On our trip it was extensively used by many members of the Expedition for equally many purposes. Even China teapots were stuck together and withstood the ravages of hot tea.

The next question is that of films. Glass plates are more or less out of the question on account of the weight. Also the manufacture of film has advanced sufficiently so that the more portable materials are just as good. These are cut film, film pack, and roll film.

My own personal reaction to the film question is in favor of cut film. There is more latitude in the emulsion and because the base is stiffer they are more readily handled in developing. The disadvantage, however, is the fact that they must be loaded into holders or magazines in a dark room or in a changing bag. But this is not a serious handicap if any extensive work is to be done. I solved the problem by having two magazines holding twelve films each. In addition I had twelve double cut film holders. This gave me four dozen exposures without reloading and although I was occasionally forced to use a daylight loading bag I suffered little inconvenience. Incidentally, with a little practice one can work very quickly with the bag. The only difficulty is from the hands sweating. By practice one can get through unloading, boxing the films and reloading before this has become too marked.

Film packs are lighter and more easily changed. Their chief disadvantage in the tropics is the fact that they may all stick together so that when the first tab is pulled, the entire twelve are brought back together. On account of this danger I took no film packs. With care, however, I think this could be avoided if the packs are kept well sealed up to the time of use.

Unless one is using a roll film camera I would advise against roll films if one expects to develop in the field. They are awkward to handle and are easily scratched. On the other hand, with six picture rolls and each one in a sealed tin, they can be very convenient in the rainy season for they are then subjected to the minimum moisture, can be quickly returned to their tins and stored away. I took a limited amount with me for just such conditions. Actually I found them acceptable at the end of the trip where I was no longer developing my pictures and did not wish the bother of unloading cut film magazines.

With regard to the keeping of this film, I found that the best method was to actually solder it into tin containers making sure that the cap extends well down over the top. Then after opening and using the film it can be put back in the tin, the cap put on and the opening taped with adhesive. This protects against further moisture until developing. I never put more than three dozen individual pictures into one tin for fear of having them open too long. I also had my roll film and cinema film packed in this way but with these, each roll was in an individual taped tin for further protection so that none were open to the atmosphere except while in the camera — and were immediately returned to their container when exposed. The movie film was in one-hundred-foot lots, five hundred feet to the large tin. While mentioning movie film, I might state that eight tins of five hundred feet each in their wooden box weighed about sixty pounds which is considered a one-man load.

The use of filters will have to be adjusted to the film. Their advantages are the same as in more temperate climates.

Development was to me a prospective hazard but quite simple in retrospect. I tested out several varieties of developing formulae and eventually decided on the following, recommended by Mr. Herbert Lang of the Museum of Natural History in New York.

Agfa Amidol	1
Sodium Sulfite (anhydrous)	10
Potassium Bromide	1
Water	200

The reasons for this are (1) It is an easy formula to remember, (2) It requires very few chemicals, (3) It has no carbonate and (4) As near as I can make out you can vary the proportions to very wide limits with little ulterior effects.

The advantage of there being no carbonate in the formula is quite great in that there is a marked difference between films developed in a formula with and without this chemical at high temperatures. With carbonate the emulsion swells so much that the image is in relief while without carbonate this feature is practically entirely absent. The difference in drying, therefore, is very great. In testing these out before leaving I found that the ease of handling with the amidol developer was so much greater than with other formulae that I do not hesitate in highly recommending it. The reason for the relatively large amount of sulfite is to add contrast, while the excess of bromide is necessary to prevent fogging of the negative in warm solutions. This developer, in fact, worked so well in laboratory tests that I gave up any idea of taking formalin hardeners.

Speaking of hardeners, I found that by adding Potassium bichromate to the hypo solution about three ounces to the pound of acid hypo gave me excellent results.

I also took sodium sulfate with me to prevent the gelatin from swelling, in case I could get no water below 90° F. but never used it. I do not recommend it.

Every individual photographer has his own hobbies on methods of development. I personally incline to the open tank, each negative suspended from a clip. For this purpose I had three rectangular tanks holding sixty-four ounces each. In addition I had a washing box of the same size which permitted water to run in at the bottom and out at the top. I found this method very satisfactory. The chief difficulty in developing is washing. One can either use several shifts of water or use running water. I am in favor of the latter and found that by hanging a bag or standing a pail above the level of the washing boxes I could then syphon into the various containers with rubber tubing, regulating the rate of flow by screw clamps. The suspended bag could then be filled with filtered water as often as necessary.

The movies offered a more difficult problem. For them I used the Steinman tank system. This consists of three nesting circular pans holding about two hundred ounces of water. In them fits a spiral cage upon which can be wound the movie films. When loaded they are placed in the pans and developed on the open tank principle. For drying they are wound into a revolving rack. Although I found that films could be handled successfully, I am inclined to believe that unless one is making a specialty of movies, it would be much wiser to keep them carefully stored until the end of the trip. The amount of time and energy necessary to develop them is not worth the results.

For a dark room lamp, I have found the oil burning type the best.

Drying the negatives may offer a few difficulties. In the first place during the more severe bouts of dampness during the rainy season it may take days for negatives to dry. In one region I had to wait until a slight clearing of the skies on the fourth day, before I could pack my films. In the second place, one must guard against flies and dust. With well hardened films this is not so important but in very warm weather it may become necessary to hang a net over the films to keep insects off.

All in all I found comparatively little trouble during the entire trip in developing about 1200 still pictures and a little over 5000 feet of the 15,000 ft. of moving picture film exposed. The remainder of this was developed in the United states after the return of the Expedition with no apparent deterioration due to storage.

For keeping the negative after drying I used the Eastman Kodak books with an individual waxed paper envelope for each negative. The negatives themselves can be numbered on the corner with the description or identification in the index.

For carrying and protecting this outfit I found that hard fiber cases were the lightest and most durable. These I had made to order to fit the various contents.

So much for the equipment and methods which were found to be quite simple yet adequate for the needs of the expedition.

In retrospect I feel safe in saying that photography in Africa is really a comparatively simple matter provided one takes a few precautions. After all, the heat is not sufficiently great to produce too abnormal conditions, and although the dampness occasionally becomes a nuisance, it can be overcome without too many difficulties. There was one factor, however, which surprised me. Knowing that the light values in photography increase as one approaches the equator, I expected that I would be able to use very short exposures when taking pictures in the sunlight. In consequence I underexposed my first set of pictures badly. This indicated that the light was not as powerful as I had supposed. But that was not the end, for when I developed the first lot of negatives taken on a dark, rainy day, I found them decidely overexposed. From this I learned that there was relatively little difference between sunshine and rain as far as the photographic intensity of the light was concerned, and furthermore, that it was possible to get negatives when normally one would have considered it too dark.

The only other major difficulty I was brought face to face with was the reproduction of copper-colored skin lesions on negroes. This I never did solve, and for the most part the change in skin pigmentation has remained unfilmed and only in the memory of its observers.

INDEX

INDEX

Acanthotermes, 822
Acarina, 799
Accipiter, 657
Acisoma, 1041
Acknowledgments, 7
Acridiidae, 824
Acrocephalus, 721
Actitis, 666, 752
Actophilornis, 668
Actornithophilus, 997
Adersia, 902
Aëdes, 190, 224, 831
Aegophagamyia, 878
Aerops, 683
Aethosciurus, 592
African Republic of Liberia:
  agriculture, 116
  army (frontier force), 36
  birds, 184, 636
  botany, 164, 513
  climate, 27
  constitution, 36
  customs of the people, 83
  early history, 32
  entomology, 189, 797
  financial conditions, 135
  forest products, 116, 224
  geography, 12
  government, 36
  governmental conditions in interior, 110
  inhabitants, 32, 83
  industries, 126
  interior (knowledge regarding), 3
  languages, 54, 56, 68, 76, 105
  mammals, 179, 569
  medical conditions, 199
  medical and economic entomology, 797. *See also* Mosquitoes and Diptera
  medical and pathological investigations, 210
  mosquitoes, 190, 193, 199, 231, 825
  population, 38
  prevailing diseases, 202
  protozoological studies of smaller animals in, 412, 414, 415, 422, 426, 427, 490
  reptiles and amphibians, 186, 769
  rubber plantations, 132, 522, 530. *See also* Firestone Plantations Co.
  sanitary and medical conditions, 198
  slavery, 70, 108, 207
  tabanid fauna, 859
  travel in interior, 140
  trypanosomiasis (human), 497
  zoology, 179, 569, 636, 769
Afroxyechus, 664, 751
Agama, 188, 776, 788
Agamidae, 776
Agamospirura, 427, 484
Agapornis, 678
Agelastes, 661
Agriculture, farm, and forest products, 116
  crops and food, 116, 118, 121
  forest products, 124
  rubber production, 132
Ainhum, 257
Albinism, 350
Alcedinidae, 680, 754
Alcedo, 680
Alethe, 714
Alseonax, 701
Amauresthes, 740
Amaurocichla, 724
Amblyomma, 800
Amyda, 770
Analgesidae, 815
Anatidae, 652
Ancala, 905
Ancylostoma, 202, 356, 394
Andropadus, 708, 758
Aneurobracon, 1002
Anhinga, 648
Anhingidae, 648
Animal Parasitic Infections, 202, 356, 412
Ankylopteryx, 1047
Anomalurella, 591
Anomaluridae, 591
Anomalurus, 591
Anopheles, 190, 199, 231, 843
Anoplocephala, 422, 462, 473
Anoplura, 994, 1038
Anous, 752
Antelope, 180, 373, 448, 609
Anthreptes, 718
Anthus, 728
Antimony, 499, 502
Ants, 194. *See also* Termites
Aonyx, 580
Apaloderma, 693
Aphelenchus, 392
Aplopelia, 672
Aponomma, 803

Apus, 691
Arachnoidea, 798
Archaeopsyllidae, 1000
Ardea, 750
Ardeidae, 649, 750
Ardeirallus, 651
Arenaria, 665
Argantidae, 812
Armigeres, 831
Armillifer, 458
Arthroleptis, 780, 793
Artiodactyla, 606
Artomyias, 703
Ascalaphidae, 1047
Astur, 657
Ateloza, 904
Atelozella, 905
Atheris, 775, 787
Atherura, 604
Athesmia, 419
Atilax, 582
Atimastillas, 710, 758
Atylotus, 904
Auchmeromyia, 194, 972
Aviceda, 654

Baeopogon, 711
Balearica, 751
Balearicidae, 751
Bat
  infection of, 188, 414, 496
  plasmodium of, 492
Bdellolarynx, 986
Bedriagia, 788
Belgian Congo
  animal parasitic infections, 412, 427
  birds, 749
  medical and economic entomology, 797
  mosquitoes, 827
  relapsing fever, 362
  reptiles and amphibians, 786
  sleeping sickness, 367
  tabanid fauna, 859
  trypanosomiasis, 369, 448, 452
Bessonornis, 712, 760
Bias, 705
Bilharziasis. *See* Schistosomiasis
Birds. *See* Ornithology
Bitis, 186, 188, 426, 774, 787
Bittacus, 1047
Blastomycosis, 321
Bleda, 709
Blood protozoa studied in Liberia, 490
Boaedon, 786
Boiga, 773
Boocercus, 182, 614
Boophilus, 809
Botanical report of Liberia, 164, 513
  Banga to Monrovia, 564
  coastal region, 525
  Firestone Plantation No. 3, 530
  Firestone Plantation No. 3 to Gbanga, 536
  Flora, 164
  Gbanga, 541
  Gbanga to Paiata, 551
  Monrovia and vicinity, 514
  Paiata to Banga, 558
  up the Du River, 528
Bothridium, 424, 426
Bouvieromyia, 877
Bovidae, 180, 448, 609
Brachycope, 767
Braconidae, 1002
Braunsiomyia, 902
Brevicipitidae, 778
Bubo, 689
Bubulcus, 750
Buccanodon, 694
Bucerotidae, 685
Budytes, 728, 762
Buffalo, 182, 614
  infection of, 436, 437, 438
Bufo, 427, 777, 791
Bufonidae, 777, 785
Buphagidae, 757
Buphagus, 757
Buplex, 885
Burhinidae, 668, 752
Burhinus, 668, 752
Bush schools, 83
Buteo, 657
Butorides, 649
Bycanistes, 685

Cacodmus, 823
Cacosternum, 796
Caeciliidae, 777
Calabaria, 772
Calliphoridae, 194, 972
Calopelia, 672
Calyptocichla, 710
Camaroptera, 722
Campephaga, 700
Campephagidae, 700
Campethera, 695
Canirallus, 662
Capitonidae, 693, 756
Caprimulgidae, 690
Caprimulgus, 690
Cardioglossa, 781
Carnivora, 180, 458, 460, 580
Casmerodius, 649
Causus, 774, 787
Centroclisis, 1046
Centropus, 676, 753
Cephalophus, 180, 609

Ceratocheilus, 1019
Ceratogymna, 687
Cercocebus, 180, 421, 422, 587
Cercopithecidae, 587
Cercopithecus, 180, 412, 415, 419, 421, 422, 440, 463, 478, 587
Ceriagrion, 1039
Certhiidae, 724
Ceryle, 680
Cestoda, 421, 462
  Anoplocephala, 423, 473
  Bothridium, 424, 426
  Cysticercus, 455, 477
  Diphyllobothrium, 427, 458
  Echinococcus, 427, 430, 433, 448, 458
  Taenia, 438, 453, 477
Cetacea, 620
Ceuthmochares, 676
Chalcomitra, 717
Chamaeleon, 777, 790
Chamaeleontidae, 777
Chamaesaura, 788
Charadriidae, 663, 751
Charadrius, 663
Chimpanzee, 180, 590
  infection of, 413, 421
Chironomidae, 846
Chiroptera, 573
Chlidonias, 670
Chlorophis, 772
Chlorophoneus, 725
Choeropsis, 606
Chrysococcyx, 674
Chrysopa, 1047
Chrysopidae, 1047
Chrysops, 193, 231, 889
Cicindelidae, 1001
Ciconiidae, 651
Cimex, 823
Cimicidae, 823
Cinnyricinclus, 746
Cinnyris, 715, 759
Circulatory diseases, 358
Circus, 658, 751
Cisticola, 722, 759
Civettictis, 580
Clamator, 674
Claviglis, 595
Climate, 27
Clydonodozus, 1014
Cobboldia, 446, 975
Cobboldina, 440, 463
Coenomyiinae, 863
Coleoptera, 1001
Coliidae, 756
Colius, 756
Coliuspasser, 736, 763
Colobidae, 589
Colobostrongylus, 420, 469
Colobus, 180, 412, 415, 416, 419, 420, 422, 463, 464, 472, 478, 589
Colpocephalum, 998
Colubridae, 772
Columba, 670
Columbidae, 670, 753
Conosia, 1014
Coracias, 754
Coraciidae, 679, 754
Coracina, 701
Cordylobia, 194, 972
Corvidae, 747, 757
Corvultur, 757
Corvus, 747, 757
Corythaeola, 677
Corythornis, 681, 754
Cossypha, 712
Cotylophoron, 436, 437, 452
Craw-craw, 347, 814
Crecopsis, 751
Cricetomys, 597
Crinifer, 754
Crocidura, 571
Crocodile, parasites of, 186, 495, 770
Crocodylidae, 770
Crocodylus, 186, 770
Crossarchus, 583
Crotaphopeltis, 773
Ctenocephalus, 197, 1000
Ctenodactylidae, 602
Cuculidae, 673, 753
Cuculus, 673
Cueta, 1047
Culex, 190, 193, 199, 231, 836, 847
Culicidae, 825
Culicoides, 193, 231, 847
Cuncuma, 656
Cyanomitra, 717
Cylicospirura, 460, 480, 482
Cysticercus, 455, 477. *See also* Cestodes

Dasycompsa, 870
Dasymys, 600
Dasypeltidae, 773
Dasypeltis, 773, 787
Degeeriella, 998
Delphinidae, 620
Demigretta, 649
Dendraspis, 186, 188, 774
Dendrocygna, 653
Dendrohyrax, 615
Dendropicos, 697
Dephomys, 597
Dermacentor, 809
Dermal moniliasis, 328
Dermanyssidae, 816
Dermaptera, 824

Dermatophilus, 197, 999
Diaphorophyia, 702
Dicrocoelium, 418, 419, 463
Dicruridae, 745
Dicrurus, 745
Dinopsyllus, 1001
Diphyllobothrium, 427, 458
Diplogaster, 394
Dipsadomorphidae, 773
Diptera, 193, 825
Diptera (of special medical importance)
  Chrysops, 193
  Cobboldia, 446
  Glossina, 193, 384, 452
  Ruttenia, 446, 448
  Simulium, 193, 242, 852
  Stomoxys, 193
  Tabanidae, 858
  Tsetse, 193, 452
  See also individual genera
Diseases affecting the skin, 331
Disparoneura, 1039
Dissoura, 651
Dolichopsyllidae, 1000
Dorcaloemus, 883
Dorcatherium, 608
Dracunculus, 238, 421, 458
Dryoscopus, 726
Dryotriorchis, 656
Dysentery, 357

Echidnophagidae, 999
Echinococcus, 427, 430, 433, 448, 458
Edentata, 182, 605
Eidolon, 573
Elanus, 655, 750
Elapidae, 773
Elephant, infection of, 443, 446
Elephantiasis, 234
Elephantidae, 184, 616
Emaciation, 360
Emballonuridae, 575
Enterobius (*Oxyuris*), 419, 478
Entomology, 189, 797
Eoctenes, 1022
Epomophorus, 574
Epomops, 573
Eptesicus, 579
Eremomela, 724
Eretmapodites, 830
Eriocera, 1012
Erolia, 665, 752
Erythropygia, 712, 761
Estrilda, 743, 766
Euancala, 905
Eulabetidae, 757
Eurylaemidae, 706
Eurystomus, 679, 754
Eurytrichodectes, 1026
Eusimulium, 193, 242, 852, 856
Euxerus, 594

Falconidae, 654, 750
Falculifer, 815
Felidae, 180, 458, 460, 583
Felis, 460, 583
Fetish doctors, 94
Filarial cyst, 237
Filariasis, prevalence and transmission, 231
Financial conditions in Liberia, 135
Firestone Plantations Company, 4, 7, 11, 28, 29, 132, 134, 138, 173, 200, 207, 209, 530, 536
Flies. *See* Diptera
Flora, 163, 164, 513. *See also* Botany
Francolinus, 659, 751
Fraseria, 704
Fungus infections. *See* Sporotrichosis
Funisciurus, 592
Flying fox, infection of, 414
Frog, infection of, 427
Füllebornia medinensis, 238, 421, 458

Galachrysia, 667
Galagoides, 586
Galerella, 582
Gangosa, 308
Gastrodiscus, 434
Gastropyxis, 772
Geckonidae, 775
Genetta, 581
Geocichla, 714
Geography, 12
Geology, 163, 514
Geotrypetes, 777
Glareolidae, 667
Glossina, 193, 384, 452, 989
Glossinidae, 987
Gnathostoma, 458
Gonomyia, 1016
Gonorrhoea, 358
Gorilla:
  infection of, 413, 422, 423, 473
  notes on, 623
Goundou, 314
Governmental conditions in interior, 108
Grayia, 773
Guinea worm, *Füllebornia medinensis*, 238, 421, 458
Guttera, 661
Guyona, 877
Gymnobucco, 693
Gymnogenys, 658
Gypohierax, 657

Haemaphysalis, 810
Haematobia, 986

Haematomyzidae, 997
Haematomyzus, 997
Haematopinidae, 996, 1038
Haematopota, 947
Hagedashia, 651
Halcyon, 680
Hapsidophrys, 773
Hectopsyllidae, 999
Helicomitus, 1047
Heliornithidae, 663
Heliosciurus, 593
Helius, 1012
Helminthic infections of monkeys, 416, 421
Hemidactylus, 775, 788
Hemimeridae, 824
Hemimerus, 824
Hemiptera, 1022
Hemisus, 778
Herpetology, 769
Heteroptera, 823
Himantornis, 662
Hinea, 871
Hippocentrum, 970
Hippopotamus, 182, 606
  infection of, 438, 440, 443, 462, 465
Hipposideridae, 577
Hipposideros, 577
Hirundinidae, 698
Hirundo, 698
Hodgesia, 831
Homalosoma, 787
Hoplopleura, 1038
Hormodendrum infection, 338
Hormonotus, 772
Hyalomma, 804
Hybomys, 601
Hydrobates, 647
Hydropsychidae, 1047
Hyena, infection of, 428, 429
Hylambates, 782
Hylia, 720
Hylomyscus, 599
Hypargos, 743
Hyperobius, 783, 794
Hyphanturgus, 732, 766
Hypsignathus, 574
Hyracoidea, 615
Hystrichopsyllidae, 1001
Hystricidae, 604
Hystrix, 604

Illadopsis, 713, 761
Indicator, 695
Indicatoriidae, 695
Industries and occupations of natives, 64, 80, 126
Infectious diseases, 202, 210
Inhabitants
  Americo-Liberians, 37
  early history, 32
  government, 35, 36, 37
  tribal customs, 83
  tribes: Indigenous, 48
    Bassas, 50
    Buzis, 74
    De, 74
    Gbandi, 74
    Gibis, 74
    Gios, 72
    Grebos, 50
    Jarquellis, 68
    Kpwesi (Kpelle), 60
    Krus, 46
    Mambas, 74
    Mandingoes, 52
    Manos, 72
    Vais, 56
    welfare of, 204
  Smaller tribes, 76, 82
Insecta, 819
Insectivora, 571
Intestinal infections, 202, 356
Islands of the Gulf of Guinea, tabanid fauna of, 859
Isoptera, 819
Ispidinia, 681, 754
Ixobrychus, 650
Ixodes, 799
Ixodidae, 197, 362, 799
Ixonotus, 709

Jacanidae, 668
Juxta-articular nodules
  diagnosis, 258
  etiology, 265
  pathological histology, 262

Kalotermes, 819
Kalotermitidae, 819
Kaupifalco, 656
Keloid formation, 253
Kerivoula, 579
Kinixys, 770
Kleineana, 891
Koiropotamus, 606

Lacerta, 776, 788
Lacertidae, 776
Laelaps, 818
Laemobothriidae, 998
Laemobothrion, 998
Lagnosticta, 743
Lagonosticta, 765
Lampribis, 651
Lamprocolius, 746
Lampromorpha, 674

Lamprotornis, 757
Languages, 54, 56, 76
  Bulom, 106
  dialects, 68, 105, 106
  Gola, 106
  Kpwesi, 105
  Kru, 106
  Mandingo, 105
  Vai, 105
Laniarius, 726, 757
Laniidae, 724, 757
Lanius, 727, 757
Laridae, 669, 752
Lecteria, 1016
Leeuwenhoekia, 815
Leggada, 600
Leiperiatus, 443, 465
Lemniscomys, 601
Leopard, 180, 458, 482, 583
Leopard men, 100
Lepidopygia, 739
Leprosy and complicating infections, 318
  prevalence and nature, 318
  blastomycosis and leprosy, 321
  relationship to dermal moniliasis, 328
Leptopelis, 782
Lesneus, 903
Libellago, 1039
Liberia. *See* African Republic of
Limnocorax, 662, 751
Limonia, 1007
Linguatulida, 422, 798
  Armillifer, 458
  Porocephalus, 426, 436, 461
Linguatulidae, 798
Lion, 460, 480
Lipeurus, 998
Liponyssus, 816
Lizard, infection of, 427, 468, 493
Lophoceros, 685
Lophuromys, 602
Lorisidae, 586
Loxodonta, 184, 443, 446, 616
Lutra, 580
Lutzia, 840
Lycophidion, 772, 787
Lygodactylus, 775, 788

Mabuya, 776, 790
Machaerhamphus, 655
Macronyx, 729
Macrotermes, 196, 819
Malacomys, 602
Malaconotus, 726
Malaria:
  prevalence, 202, 210
  prophylaxis and quinine, 156, 210
  malarial parasites of animals, 412, 492
Malimbus, 734
Mallophaga, 997, 1023
Mammals, 180, 569
Manidae, 182, 605
Maschalocephalus Dinklagei, 168, 560
Mastomys, 598
Mecoptera, 1047
Medicines and poisons, 95
Megabias, 705
Megaceryle, 680
Megalixalus, 782
Megaloglossus, 575
Megarhinus, 829
Melanophox, 649
Melanopteryx, 732, 767
Melittophagus, 684, 755
Melocichla, 722
Menopon, 998
Menoponidae, 997
Meropidae, 683, 755
Merops, 683
Mesomyia, 869
Mesopicus, 697
Metaphara, 880
Micropodidae, 691
Micropteropus, 574
Micropus, 692
Milvus, 654, 750
Miodon, 773
Mongoose, 180, 582
  infection of, 427, 483
Monkey, 180, 586
  infection of, 412, 415, 416, 419, 420, 421, 422, 440, 463, 472, 478
  plasmodium of, 491
  balantidium of, 496
Monrovia, 15, 38, 40, 44; *see also* African Republic of Liberia
Mosquitoes, Midges (of medical importance)
  Aëdes, 190, 224, 831
  Anopheles, 190, 199, 231, 843
  Culex, 190, 193, 199, 231, 847
  Culicoides, 193, 231, 847
  See also Culicidae, and individual genera
Motacillidae, 727, 761
Muridae, 596
Murshidia, 446
Muscicapa, 702
Muscicapidae, 701, 756
Muscidae, 975
Musophaga, 753
Musophagidae, 677, 753
Mustelidae, 580
Myonycteris, 575
Myoxidae, 595
Myrmeleonidae, 1045
Myrsidea, 997
Myrsilus, 594

Naja, 773, 787
Nandinia, 581
Nanonycteris, 574
Natrix, 772
Nectarinia, 758
Nectariniidae, 715, 758
Nematoda, 421
  Agamospirura, 427, 484
  Ancylostoma, 202, 356, 394
  Aphelenchus, 392
  Cobboldina, 440, 463
  Colobostrongylus, 420, 469
  Cylicospirura, 460, 480, 482
  Diplogaster, 394
  Dracunculus, 458
  Enterobius (*Oxyuris*), 419, 478
  Gnathostoma, 458
  Leiperiatus, 443, 465
  Murshidia, 446
  Nematodirus, 462
  Ophidascaris, 424, 426
  Oswaldocruzia, 427, 462, 468
  Oxyspirura, 427, 483
  Saurositus, 427
  Setaria, 448, 455
  Streptopharagus, 420, 478
  Strongylidae, 427, 462
  Trichuris, 419, 420, 478
  Tylenchus, 409, 487
Nematodirus, 462
N'gonde, 276, 278
Neocossyphus, 711
Neoplasms, 356
Neotragus, 180, 609
Nephrotoma, 1005
Nervous system, diseases of, 360
Neuroptera, 1045
Nicator, 725
Nigrita, 740
Nuceria, 886
Numenius, 666
Nycticorax, 650

Oceanites, 647
Oceanodroma, 647
Odonata, 1039
Ommatiosteres, 885
Onchocerciasis, 240
  onchocerciasis and keloid formation, 253
  pathological conditions caused by *Onchocerca*, 247
Onychognathus, 746
Ophidascaris, 424, 426
Orgizomyia, 877
Oriolidae, 744
Ornithology, 184, 636
  birds of Liberia, 636
  birds collected in the Belgian Congo, 749
  infection of birds, 427
  parasites of birds, 494
Oriolus, 744
Ornithodoros, 362, 812
Orthetrum, 1040
Orthoptera, 824
Ortygospiza, 742
Osteolaemus, 770
Oswaldocruzia, 427, 462, 468
Otus, 688
Otyphantes, 766
Oxyspirura, 427, 483

Palpares, 1045
Palpopleura, 1041
Pan, 421, 590
Pangoniinae, 863, 868
Panorpidae, 1047
Paragonimus, 458
Paramphistomum, 436, 440, 452
Parasites of plants,
  Tylenchus alatus, 409, 487
  See also Plant Diseases
Parasitic helminths collected, 462
Parasitic infections of animals, 412, 415
  antelope, 448
  bat, 414, 496
  buffalo, 436, 437, 438
  chimpanzee, 413
  crocodile, 495
  elephant, 443, 446
  flying fox, 414
  frog, 427
  gorilla, 413, 422, 423, 473
  hippopotamus, 438, 446, 448
  hyena, 428
  leopard, 458, 482
  lion, 460, 480
  lizard, 427, 468
  mongoose, 427, 483
  monkey, 412, 416, 419, 420, 421, 422, 440, 463, 469, 478, 496
  rat, 496
  reptiles and amphibians, 424, 426, 496
  topi, 453, 455, 477
  wart hog, 430, 434, 436
  other animals, 414, 433
Parasitidae, 818
Parasphena, 824
Parisoma, 706
Passer, 762
Pathological conditions:
  cosmopolitan diseases, 356
  pathology of onchocerciasis, 244, 247
Pawning of women, 70, 108
Pediculidae, 994
Pediculus, 197, 994
Pedilorhynchus, 705

Pernis, 655
Perodictius, 586
Petalia, 576. *See also* Bat, infection of
Petaliidae, 576
Phalacrocoracidae, 648
Phalacrocorax, 648
Phalaropodidae, 667
Phalaropus, 667
Phara, 879
Phasianidae, 659, 751
Phataginus, 605
Philaematomyia, 978
Philoliche, 880
Philopteridae, 998
Philothamnus, 772
Phlebotomus, 825
Phoenicopteridae, 652
Phoenicopterus, 652
Pholidornis, 704
Photography, 1048
Phrynobatrachus, 779, 792
Phyllanthus, 714
Phyllastrephus, 710
Phylloscopus, 721
Physeter, 620
Physeteridae, 620
Phytophthora Meadii, 524
Picidae, 695
Pipidae, 777
Pipistrellus, 578
Pitta, 698
Pittidae, 698
Plague (bubonic), 364
Plant diseases, 389
  cinchona infection, 407
  coconut disease, 389, 397
  mosaic disease of mandioca, 397, 400
  rubber tree infection, 409, 524
  other plant diseases, 402
  See also, Parasites of Plants
Plasmodia, 412, 415, 490, 493
  of bat, 414, 492
  of jumping rat, 414
  of lizard, 493
  of monkeys, 412, 491
Platystira, 702
Plectropterus, 653
Plesiositagra, 729
Ploceidae, 729, 762
Pneumonoeces, 427
Pneumonyssus, 1817
Podica, 663
Podoneura, 1017
Pogoniulus, 694, 756
Poiana, 581
Polyctenidae, 1022
Polymorphanisus, 1047
Polyplax, 996, 1038
Pongidae, 590
Population, 37
Porocephalus, 436, 461
Praomys, 599
Prevailing diseases, 202, 210
Primates, 180, 412, 586
Prinia, 721, 760
Problems concerning the welfare of the people, 204
Proboscidea, 616
Procaviidae, 615
Procellariidae, 647
Pronopes, 871
Protorimarga, 1010
Protoxerus, 594
Protozoa
  Balantidium, 496
  Grahamella, 496
  Haemogregarines, 495, 496
  Haemoproteus, 494
  See also Reptiles and Amphibians, Trypanosomiasis
Protozoological studies of the blood of smaller animals, 490
Psalidoprocne, 700
Psammophis, 773
Pseudoxenopus, 778
Psittacidae, 678
Psittacus, 678
Psychodidae, 825
Pteronetta, 652
Pteropidae, 573
Pulicidae, 1000
Pycnonotidae, 706, 758
Pycnonotus, 710, 758
Pyrenestes, 742, 765
Pyromelana, 737, 764
Python, 189, 424, 772
Pythonidae, 772

Quelea, 735, 765

Rallidae, 662, 751
Rana, 778, 792
Ranidae, 778, 785
Rat, 184, 366
  Rat (jumping), *Plasmodium* in, 414, 496
Rattus, 366, 596
Relapsing fever, 362, 813
Reptiles and Amphibians, 186
  from Liberia, 769
  from Central African Lake Region, 786
  infections of,
    Bitis nasicornis, 426
    python, 424
  parasites of, 496
Rheumatic fever (acute), 358
Rhigioglossa, 878

Rhinoestrus, 448, 975
Rhinopharyngitis, *see* Gangosa, 308
Rhipicephalus, 805
Rhynchops, 670
Ricinoides, 798
Ricinoididae, 798
Ricinulei, 798
Riopa, 777
Rodentia, 591
Rodhainomyia, 976
Routes of Expedition, 4, 8, 380
Rubber production, 132; *see also* Firestone Plantations Co.
Ruttenia, 446, 448, 976

Saccolaimus, 575
Sanitary and medical conditions:
  medical conditions in Liberia, 199
  personnel, care of, 154
  prevailing diseases, 198, 202, 210
Sapho, 1039
Sarcoptes, 347, 814
Sarcoptidae, 814
Sarkidiornis, 653
Sarothrura, 662
Saurositus, 427
Saxicola, 713, 760
Scabies, 347
Scaptia, 884
Scincidae, 776
Sciuridae, 592
Scolopacidae, 752
Scotopelia, 689
Schistosomiasis, 215, 226, 510
  pathological conditions, 357
  treatment, 499, 502
Scotornis, 691
Seborrhoea, 350
Setaria, 448, 455
Sigmodus, 724
Silvius, 868
Simiidae, 590
Simuliidae, 849
Simulium, 193, 242, 852, 856
Siphonaptera, 999
Sirenia, 619
Skin diseases, 331
Slavery, 70, 108, 207
Sleeping sickness. *See* Trypanosomiasis
Small pox, 357
Smithornis, 706
Smutsia, 605
Soricidae, 571
Spermestes, 738, 765
Spermospiza, 741
Spinturnicidae, 818
Spinturnix, 818
Splenomegaly, 214
Sporotrichosis and other infections with fungi, 331
Squatarola, 664
Stasisia, 974
Stelgidillas, 707, 758
Stenophara, 882
Stephanibyx, 664
Stephanoaetus, 655
Stercorariidae, 668
Stercorarius, 668
Sterna, 669, 752
Stiphrornis, 723
Stizorhina, 706
Stomoxys, 193, 979
Streptopelia, 671, 753
Streptopharagus, 420, 478
Strigidae, 688
Strix, 688
Strongylidae, 427, 462
Sturnidae, 746
Stygeromyia, 985
Styringomyia, 1020
Subpangonia, 879
Suidae, 606
Suphalomitus, 1047
Sylvia, 720
Sylvietta, 723
Sylviidae, 720, 759
Sylvisorex, 571
Syncerus, 182, 437, 614
Syphilis. *See* Yaws and Syphilis
Sziladynus, 904

Tabanidae, 193, 858
  natural grouping, 862
  key to Ethiopian genera, 866
Tabaninae, 864, 903
Tabanocella, 873
Tabanus, 903
Tachinidae, 975
Tachynautes, 692
Taenia, 438, 453, 477
Taeniorhynchus, 841
Tchitrea, 703
Termites, 196, 819
  Coptotermes niger, 392
Termitidae, 819
Terpsiphone, 756
Tetrathemis, 1040
Teucholabis, 1018
Textor, 767
Thamnomys, 598
Thaumastocera, 945
Thelotornis, 773
Therioplectes, 903
Tholymis, 1041
Threskiornithidae, 651
Thriambeutes, 876

Thryonomys, 602
Tigriornis, 650
Timaliidae, 713, 761
Tinea vesicolor infection, 346
Tipula, 1004
Tipulidae, 1004
Topi, infection of, 453, 455, 477
Trachylaemus, 695
Tragelaphus, 182, 373, 452, 613
Tragulidae, 608
Travel in the interior, and care of personnel, 140
Trematoda
  Athesmia, 419
  Cotylophoron, 436, 437, 452
  Dicrocoelium, 418, 419, 463
  Fasciola, 448
  Gastrodiscus, 434
  Paragonimus, 458
  Paramphistomum, 436
  Pneumonoeces, 427
Trentepohlia, 1016
Treronidae, 673
Trial by ordeal, 102
Tribal customs, 82, 83, 99
Trichechidae, 619
Trichechus, 619
Trichodectes, 1026
Trichodectidae, 1024
Tricholaema, 693
Trichophyton infection, 346
Trichoptera, 1047
Trichuris, 419, 420, 478
Triclida, 877
Tringa, 666
Trionychidae, 770
Trithemis, 1042
Trochocercus, 705
Trogonidae, 693
Trombicula, 815
Trombidiidae, 815
Tropical phagedenic ulcers, 354
Tropicranus, 686
Trypanosomiasis, 367, 452
  conditions in Ruchuru and Ruindi plains, 380
  conditions in Semliki Valley, 384
  diagnosis, 376
  differentiation of trypanosomes, 369, 453
  occurrence in Liberia, 367
  occurrence in the Congo, 369
  prevalence, 376
  prophylaxis and treatment, 386, 504
  trypanosomes of antelope, 373, 453
    buffalo, 438
    hyena, 428
    monkey, 422
    wart hog, 436
  trypanosomiasis (human) in Liberia, 497
Tschagra, 725
Tsetse flies, 193, 384, 452, 989
Tuberculosis, 358
Turacus, 677
Turdidae, 711, 760
Turdoides, 761
Turdus, 712
Turnicidae, 659
Turnix, 659
Turtur, 672
Turturoena, 671
Tylenchus, 409
Tylenchus alatus, 487
Tympanistria, 671, 753
Typhlopidae, 770
Typhlops, 770, 786

Umbilical hernia, 356
Uranotaenia, 829
Urobrachya, 764
Uromanis, 182, 605
Urotriorchis, 658

Varanidae, 776
Varanus, 776
Vespertilionidae, 578
Vidua, 744, 762
Vinago, 673
Viperidae, 186, 774
Vitiligo, 349
Viverridae, 580

Wart hog
  infection of, 430, 434, 436
Water (drinking):
  chlorination, 506
  test analyses, 509
  water for travellers in tropics, 505
  water supply, Liberia, 24, 40
  water supply, Monrovia, 199
Wild Game, 427

Xenopus, 777, 791
Xiphidopterus, 665

Yaws and Syphilis, 272, 308
  differentiation of yaws and syphilis, 279
  pathological histology of yaws and syphilis, 279
  prevalence and character, 272
  tertiary yaws and n'gonde, 278
Yellow fever, 223. *See also Aëdes*

Zoology, 179, 569, 623, 636, 749, 769, 786
Zosteropidae, 720
Zosterops, 720

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